TERRACOTTA RING WELLS: AN ETHNO-ARCHAEOLOGICAL STUDY WITH SPECIAL REFERENCE TO ORISSA

(Thesis submitted to Utkal University for the fulfilment of Ph. D. Degree in Ancient Indian History, Culture & Archaeology)

By

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Regd. No. – 7-AIHC & A, 2002

Under the guidance of

Prof. A.N. Parida



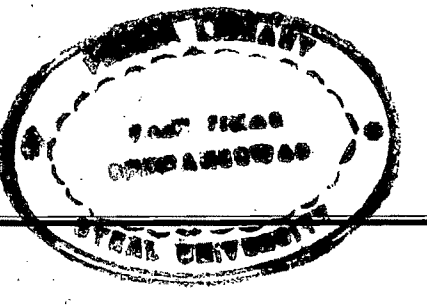
P. G. DEPT. OF ANCIENT INDIAN HISTORY, CULTURE AND ARCHAEOLOGY,
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2007

DEDICATION

Dedicated in the sacred memory of my father

Late Sudhasindhu Jena





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CERTIFICATE

This is to certify that the Ph. D. thesis entitled **"Terracotta ring wells, an ethno-archaeological study with special reference to Orissa"** has been prepared by Sri Gopinath Jena for submission to Utkal University for the award of Ph. D. Degree. The research work presented in this thesis is original one and prepared under my direct supervision. To the best of my knowledge this has not been submitted, in part or full, for any degree or diploma of this University or any other institution.

4.9.2007
(A. N. Parida)
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AREA CERTIFICATE

This is to certify that the Ph. D. thesis of Sri Gopinath Jena entitled "**Terracotta ring wells, an ethno-archaeological study with special reference to Orissa**" is an original one prepared under my direct supervision. The thesis pertains to the field of archaeology of the subject Ancient Indian History, Culture and Archaeology under which this has been registered for the award of Ph. D. Degree by the University.

4.9.2007

(A. N. Parida)
Guide

DECLARATION

I do hereby declare that the thesis entitled "**Terracotta ring wells, an ethno-archaeological study with special reference to Orissa**", being submitted by me for the award of Ph.D. Degree by Utkal University in Ancient Indian History, Culture and Archaeology is an original piece of work done by me through extensive field work and has neither been published nor submitted elsewhere, in full or part, for any degree.

4/9/2007

(Gopinath Jena)

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PREFACE

'Archaeology', as the lay man think is not only the study of temples, sculptures, monuments which are existing on the ground but also a specialized discipline for systematic study of the man's past through the material remains. Through the time it has developed some approaches to find out the truth and to interpret the retrieved data. This type of approach and thought has been developed within me when I was a student in the P.G. Dept. of Archaeology, Utkal University, since long back. I motivated to study the unravel part of Orissan Archaeology, where no such written document or evidence have not been came up to the public notice. As such, Orissa's real history starts with the Sailod bhabas (6^{th}/ 7^{th} Cen.AD.), but prior to that there is no such chronological record to reconstruct the history of Orissa. Hence, it has been called as the Dark Age, i.e. from post Mauryan to the rise of Sailodbhabas. Of late, I have also realized the problem of early history in Orissa. So in this point, it urged me to take up this part of Orissan history for study.

Keeping all these preliminary idea about research I went to Institute of Archaeology, New Delhi, where developed a sense of research aptitude and to analyze the data. I can recall to the cool winter of Sravasti (Uttar Pradesh), while participated in the excavation during 2000-01. The excavation was conducted in the city area of Kandhbhari gate under the able direction of Dr. G.C. Chauley, (Excavation Branch – III, Patna, ASI). But our Director, Dr. Amarendra Nath really trained us in the field. How to lay trenches, how to excavate, how to handle the

antiquities and above all how to write an excavation report, are all spoon fed by Nath Sir. Interestingly, during our excavations, two ring wells came up in the trenches and initially I was unaware about these objects. What is this? And what is its purpose? The excavation at Sravasti gave me humble opportunity to think about this object. After three month's excavation at Sravasti, the study of ring well inspired me a lot on my research area. Finally, after passing out from the Institute, I enrolled my name under my revered Sir, Prof. A. N. Parida to study ring wells in its historical perspective, it's association with urbanization and other aspects with special reference to Orissa. My Sir gave me constant encouragement and guidance without which the work could not have been completed.

Since 2002, I am seriously involved in this work and collected ethno- archaeological data in Jajpur district of Orissa, where terracotta ring well making is still a living practice. So many villages have been explored in the coastal districts of Orissa and rings wells are mostly confined to this region only. In Orissa, the districts like Jagatsinghpur, Kendrapada, Jajpur, Cuttack and Puri are having ring wells used for different purposes. But in western Orissa, these ring wells are not found yet. The ring wells are also studied in their historical perspective.

Ring wells an ethno-archaeological study with special reference to Orissa is unique of its kind in two aspects. Firstly, the area of study, where early historic sites of Orissa are properly studied in context to their urban features. Earlier, different scholars have studied different aspects of Orissan history and archaeology, but different antiquities are not yet been studied properly for answering any problem. Hence, in this regard ring

wells in archaeological context have been asked some pertinent questions for answering Orissa's urbanization and its process.

Secondly, the approach of study, where for the first time an attempt has been made for ethno-archaeological study in answering various question regarding the ring wells, its constructional and functional aspects. For this study, exhaustive documentation work is conducted to know the making technique of terracotta rings.

Though the work is a micro study, yet it is different in its approach. It is an initiation for further ethno-archaeological study in Orissa. From terracotta rings in historical context to R.C.C. rings in present day are also taken into consideration to know the line of development. Neither early history of Orissa nor ring well has been studied properly so far. Therefore, the scope of the work is very wide since the ring well is itself very deep and varied. It is not a mere lifeless object, but a trait for growth of a culture. But much more than all this, I have come to the conclusion that the terracotta ring well developed a common cultural profile which is largely different from the other objects found in the archaeological sites. Each and every object has its own identity, function in order to shape a culture. The history of any region can be shaped and understood if every individual archaeological object would studied in isolation but compared and correlated in group.

Thus, whichever way we may like to look at the problems of Indian or Orissan history and archaeology, there is absolutely no escape from the

fact that they cannot be solved in isolation. The approach, therefore, is to highlight the individual object in a cultural process.

During the study period, I can remember the words of Prof. D. K. Bhattacharya who rightly said that, in archaeology, three things are important i.e., what is it? How old it is? And what is the purpose of it? These three points are really vital in archaeology. Any object or anything should treated by asking these three questions. Then only every problem could be solved. Sticking to this point, I also tried to ask these questions to ring well in finding out many solutions.

The work is conceptualized by my Sir Prof. A. N. Parida. Through out my study period, he constantly guided and every minute care has been taken to provide the present shape. His able guidance, truthful fact findings and honest interpretation helped me a lot for the completion of this work.

I am thankful to my Sir Dr. Sanjay Acharya providing me moral support and encouragement in this regard. So also I am thankful to Prof. Sadasiba Pradhan for his advice and suggestion to complete the work before time. My Junior and brother Anam Behera also helped in providing books and Journals of the seminar library in the Department.

I am equally thankful to my Sirs, Dr. A. Nath, B. M. Pande and G.C. Chauley providing different ideas on ring wells, while I was at the Institute of Archaeology, New Delhi.

In the field work, so many friends and younger brothers have helped me a lot. I am thankful to Asish, Jatin and my friend Sushant for their support. In the work, special thanks are due to Asish and Santosh who gave their untiring help, while in the field and on the table respectively.

Thanks are due to the staff members of State Museum Library, Bhubaneswar and Parija Library, Utkal University for providing the Books and Journals. So also thanks to the staff members of the library, Institute of Archaeology, New Delhi and Central Archaeological Library, New Delhi for providing me the old excavation reports.

Constant encouragement is also given by Shri Shantanu Maiti, ASA, Ratnagiri Museum and S. N. Kuanar, LDC and the Staff members of Ratnagiri Museum like Atul, Rabindra and Sahu.

Above all, my parents, my brother and relatives are the perennial source of encouragement. My wife Alaka has left no stone unturned in completing the work. Last but not the least; in preparing the text, I am thankful to Bulu Babu, Karim and especially to Bhaskar.

Gopinath Jena

ABBREVIATION

AI	Ancient India.
ASI	Archaeological Survey of India.
ARASI	Annual Report, Archaeological Survey of India.
BDRI	Bulletin of Deccan College Research Institute.
IAR	Indian Archaeological Review.
IER	Interim Excavation Report.
JMSU	Journal of Maharaja Sayaji Rao University.
JOHC	Journal of Orissa History Congress.
MASI	Memoires of Archaeological Survey of India.
NBPW	Northern Black Polished Ware.
OHRJ	Orissa Historical Research Journal.
PGW	Painted Gray ware.
PIHC	Proceedings of Indian History Congress.
RCC	Reinforced Cement Concrete.

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CHAPTER – I

INTRODUCTION

INTRODUCTION:

In the history of civilization, it is important to note its culture, cultural traits in the form of art, architecture, society and other aspects together with its interaction between man and its surroundings. Man emerged in the earth through a process of evolution[1], and underwent a huge change in his physical attributes to get the present shape. Both biologically and culturally he attained his maturity and called as *Homo-sapiens-sapiens.* From a nomadic life in the prehistoric times to settled life in the Neolithic period and further with a group living, human being became more complex both in brain and culture.[2] Carrying an array of cultural traits and belongingness man became permanent settler of a particular region as per his convenience. This attachment to a land[3] leads man to create settlement of village, town, city and kingdom according to the increase of man power, accessibility to the raw materials and adjustment with the environment. So like human being, his cultural progress is also certainly a process of evolution in both time and space.

Considering these above two aspects, i.e. time and space, India has witnessed a great change twice in the settlement history i.e., during

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1 Robert Jurmain (*et.al*), *Essential of Physical Anthropology* (3rd Edition), west/ wadsworth, USA, 1998, PP. 24-39.

2 Grahame Clark, *World Prehistory in New Perspective* (3rd Edition), Cambridge University Press, 1996, PP.39-41.

3 D.K. Bhattacharya, *An outline of Indian Prehistory*, Palaka Prakashan, New Delhi, 1989, P.133.

the 3rd millennium BC[4] and again in the 6th Cen.BC.[5], which ultimately considered as first and second urbanizations by the people of India. With their regional differences these two have their own identity. The first urbanization occurred in north-west India, having its own urban traits like-town planning, material culture and writings, are altogether different from the second urbanization which occurred in the Ganga valley in 6th Cen. BC. about 3000 years latter.

During the 6th Cen. B.C., with effect to change, different city states[6] were emerged in various strategic points in the Ganga valley. New towns and cities emerged, leaving behind the old rural village and its culture in the background. Some cultural traits of earlier period were discarded, when some others came new to mark distinct from each other. In this process, the procurement and discharges of water system of earlier period has also been modified during this phase. Besides wells, tanks, reservoirs[7] for procurement and drains, pottery-pipes, jars were used for discharge of used water. However, this controlled use of water, its devices for storage and discharge were modified by their physical attributes and functional entity with the march of time. Among these terracotta ring well is one of the most innovative and utilitarian

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4 R. S. Sharma, "Iron and Urbanization in the Ganga Basin", *IHR*, No.1, 1974, PP.98-103.

5 V.K. Thakur, "Concept of Urban Revolution – A theoretical study of the second Urbanization in India", U. Thakur(ed), *The Heritage of India*, Bodh Gaya, 1978, PP.321-324.

6 R.S.Sharma, *op.cit*, (1974), p.99.

7 R.S.Bisht, "Dholavira: New Horizons of the Indus Civilization", *Puratattva*, 1991, p.71-82.

device, best known from about 6th Cen. BC. and it continued till date in similar or in other form in different parts of India.

'Ring wells'[8], as the name indicates is a well made of terracotta or earthen rings. Simply it is dugout well into a deep soil, by encasing earthen rings to the lateral side walls. Archaeological excavations have been conducted in early historical and historical sites in India, often been met with several such ring wells in the sites. Hence, so many questions have been raised regarding its emergence, location, construction and function of this object. Further more, some authors associate this object with the emergence of urbanization or the causes for urban growth. So in order to understand this particular object (ring well) and its relation with the other objects as a whole in a site, it has been imperative to take help from one specialized branch of archaeology, named as "ethno-archaeology". Before going to analyse other details we should discuss, in brief, about- ethno-archaeology, its meaning, scope and uses.

Why Ethno-archaeology?

Archaeological interpretation depends upon analogy-a form of inference that holds that if something is like something else in some respects it is likely to be similar in others.[9] Archaeologist draw upon their lives and upon everything they have read, heard about or seen in

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8 A.Ghosh(ed.), *An Encyclopaedia of Indian Archaeology*, Vol-I, New Delhi, 1989, p.305.

9 B.G.Trigger, *Early Civilization: Ancient Egypt in context, Cairo,* American University in Cairo press, 1993, pp.45-46.

the search for possible analogies to the fragmentary remains they seek to interpret. Archaeological remains constantly confront us with variation in space and time that provides clues to the past socio-cultural behaviour. Recognition of the need for ethnographic material based on analogies gave rise to a new sub-discipline named as "ethno-archaeology"; the ethnographic study of living cultures from archaeological perspectives. Ethno-archaeology is neither a theory nor a method, but a research strategy embodying a range of approaches in understanding a relationship of material culture to culture as a whole, both in the living context and to exploiting such understanding in order to inform archaeological concepts and to improve interpretation.

The emergence and definition of ethno-archaeology:

Jesse Fewkes[10], coined the term "ethno-archaeologist", hundred years ago in a paper on Native American migration traditions. Here archaeologist means, "who can bring as preparation for his work an intensive knowledge of the present life" of the people whose history is under investigation. Donald Thompson's paper on "the seasonal factor in human culture" is the first that, retrospectively, can be classified as ethno-archaeology in modern sense of the term.[11]

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10. J.W.Fewkes, "Tusayan migration traditions", *Bureau of American Ethnology, Annual Report*, Vol. 10, 1900, pp.579-633.

11. D.F.Thomson, "The seasonal factor in human culture, illustrated from the life of a contemporary nomadic group", *Proceedings of the Prehistoric Society*, Vol-5, 1939, p.209-21.

The formal emergence of ethno-archaeology as a sub-discipline of anthropology is best dated to 1956 of a paper by Maxine Kleindienst and Patty Jo Watson entitled "Action Archaeology: the archaeological inventory of a living community." This called on "the anthropologist to take to the field of living communities with his own theoretical orientation and gather the necessary information." In 1957, Joseph Bauxer[12] had been the first to use the term ethno-archaeology in his research paper, where as Richard Gould[13] used "living archaeology" to refer to "the actual effort made by an archaeologist or ethnographer to do field work in living human societies, with special reference to the 'archaeological' patterning of the behaviour in those societies." According to him ethno-archaeology means "a much broader framework for comparing ethnographic and archaeological patterning." Indian researchers[14] also defined ethno-archaeology in a very broad sense.

Different ethno-archaeologists defined this concept differently. Susan Kent[15] defines, "the formulation and testing of archaeologically oriented and/or derived methods, hypothesis, models and theories with

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12 J.J. Bauxer, "Yuchi ethno-archaeology: Some Yuchi identification reconsidered", *Ethnohistory*, Part-I, Vol-4, 1957, pp. 279-301.

13 R.Gould, "Some current problems in Ethno-archaeology", C.B. Donnan and C.W.Clewlow (eds.). in *Ethno-archaeology*, Institute of Archaeology, Monograph.-4, Los Angeles, University of California, 1974, pp.29-48.

14 Allchin, B (ed.), *Living Traditions: Studies in the ethno-archaeology of South Asia,* New Delhi, 1994, P.102.

15 S. Kent, "Understanding the use of space: an ethnoarchaeological approach", in S. Kent (ed.) *Method and theory for activity area research: an ethno-archaeological approach*, Columbia University Press, New York, 1987, PP. 1-62.

ethnographic data." Michael Stanislawski[16] says that ethno-archaeology as the direct observation or participant observation to study the form, manufacture, distribution, meaning and use of artifacts and their institutional setting and social unit correlates among living (generally non-industrial) peoples. However, according to Paul Bahn,[17] Ethno-archaeology.....an excellent means of getting an exotic adventure holding in a remote location...After figuring out what you think is going on with the use and discard of objects (you should never stay around long enough to master the language) you return to your desk and use these brief studies to make sweeping generalizations about what people in the past and in totally different environments must have done.

However, in a nutshell it can be said that in spite of its various definitions and nomenclatures, ethno-archaeology simply an approach to an un-determined object retrieved in the archaeological field to understand its name, its uses and other details and establishing a generalized formula by the study of relatively a primitive but simple society.

Keeping above said views in mind, here an attempt has been made to understand what is ring well and tried to answer some of the few important questions about its construction and functions by employing ethno-archaeological approach.

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16 M.B.Stanislawski, "Ethno-archaeology of Hopi and Hopi-Tewa Pottery making: Styles of learning" in D.T. Ingersoll, J.E. Yellen and W. Mac Donald (eds.), *Experimental archaeology*, Columbia University Press, New York, 1977, PP. 378-408.

17 P. Bahn, *Bluff your way in archaeology*, Ravettle Books Ltd., USA, 1989, P.61.

Regarding the time frame, it is obviously taken from its earliest occurrence in the early historical period (Pre-NBPW) to the historical or even medieval period in Indian context. Whereas, in Orissa ring wells are reported from archeological excavations, dating back to historical period and the trend continued up to present time. Geographically, the occurrences of terracotta ring wells are found throughout the length and breadth of the country. It has its wide existence in almost all states of the country, but the concentration varies from place to place. In Orissa, terracotta ring wells are found mostly in the coastal districts, where as in the western part, being the rocky area, are dotted with rock-cut wells, wells made out of cutting laterite blocks and others. However the present study is concentrated in the Jajpur district[18] of Orissa.

The source materials for the study of terracotta ring wells and its ethno-archaeological approach, have been divided into two groups, such as- primary and secondary. In primary source, we have taken help from different excavation reports carried out by both Government and non-Government organizations. For this purposes, Annual Report of the Archaeological Survey of India, Indian Archaeology-A Review, Memoirs of Archaeological Survey of India (MASI), and other first hand information gathered from some private institutions who have conducted excavations.

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[18] N. C. Behuria, *Orissa District Gazetteers Cuttack : Gazetteer of India*, Government of Orissa, Department of Revenue, Government press, Cuttack, 1966, PP.18-21.

In the secondary sources, a few published books and articles were consulted in order to understand and interpret the ring well. As occurrence of ring well is coeval with NBPW and associated with urbanization, hence, so many books, journals, articles and papers were referred to understand the very nature of urbanism, NBPW culture, urban process and growth.

In this present work though we have consulted a good number of books, journals, articles published and unpublished by different organizations, still they have their short-comings for the study of ring wells in a real sense of the term. There have been published so many books analyzing urbanization since 1960s and 70s or even prior to that but none is sufficient enough to describe urbanizations and its associated problem properly. B.B.Dutta, *Town planning in Ancient India (1925)*[19] gave a good information about the proper planning of a town in ancient India following the norms of *VastuSastra.* He on the basis of different *puranic* references tried to classify village, hamlet town and its variations. But in real sense, he failed to analyze the urban character of a settlement, its growth and other aspects. A.Ghosh in his *City in Early historical India (1973)*[20] and V.K.Thakur in his *The concept of urban revolution-A theoretical study of the second urbanization of India (1978)*[21], have convincingly analyzed the factors of urbanization, its occurrence in relation to geographical location and geological time

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19 B.B. Dutta, *Town Planning in Ancient India*, Calcutta, 1925, P.22.

20 A. Ghosh, *City in Early Historical India*, Simla, 1973, pp. 7-10.

21 V.K. Thakur, "Concept of Urban Revolution – A theoretical study of the second Urbanization in India," U. Thakur (ed.), *The Heritage of India*, Bodh Gaya, 1978, pp. 321-23.

frame. Still then they lack behind to give a holistic approach in order to define urbanization and rural-urban disparities.

Further more, R. S. Sharma's - *Urbanism in Early historic India* (1991)[22] and *Urban Decay in India*[23] vividly studied the emergence of *Janapadas* from a rural base in different pockets of north India and its cumulative factors of decline. He strongly emphasized on iron technology as the prime factor for the development and growth of urbanization, while he kept other phenomena in the background.

Going a step ahead, D.K. Chakrabarti in his paper "Some theoretical aspects of early Indian urban growth" (1974)[24], propounded the process of urban growth. Basically he stated the 'triple phase of urban growth'. But he became silent about the factors and other aspects of urbanization.

These were the researches explaining urbanization, its factors, growth and process, but none of them touched an individual finds of archaeological context for the process of urban growth. As such B.M. Pande[25] and R.N. Mehta[26] were the two pioneers to work with terracotta ring wells through their papers- "Ring wells in Ancient India (1966)" and

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22 R.S. Sharma, "Urbanism in Early Historic India", Indu Banga (ed.), *The City in Indian History, Urban Demography, Society and Politics,* New Delhi, 1991, p.8.

23 R.S. Sharma, *Urban Decay in India*, New Delhi, 1987, pp. 29-38.

24 D.K. Chakrabarti, "Some theoretical aspect of early Indian Urban growth," *Puratattva*, No.7, 1974, p.89.

25 B.M. Pande, "Ring wells in Ancient India", *BDRI*, Poona, 1966, pp. 12-23.

26 R.N. Mehta, "Ring wells Method of Construction", *JMSU*, Baroda, 1968, pp. 137-143.

"Ring wells: Method of construction (1972)". With these two papers they gave the preliminary idea about the ring wells and their importance. But they failed to analyze these in the context of other associated archaeological finds for urban growth and also not touched upon the functional aspect of ring wells.

Therefore, it is found that all of them lacked at least one aspect of their approach, in explaining the urbanization. Since 1960s and 70s, so many scientific reports on latest excavations and explorations have come up along with new interpretation but no complete study of ring well is produced. Some scholars like M.C.Joshi (1999)[27] put forth his view that terracotta ring well is the only cognizable trait of urbanization. To test the view as how far ring well is associated with urbanization and particularly to know the constructional and functional aspect of this study is also encouraged. Particularly in Orissan context, no ethno-archeological study has been conducted so far. Further more, Orissa having seven/eight early historic and historic excavated sites with urban features, and ring wells making still a living practice in the coastal region of Orissa. Keeping the facts in mind, we have taken up the study of ring wells with its ethnographic parallel.

The main objective is to verify the following facts:

(i) Area of early historic urban centres in Orissa mainly focusing on excavated sites;

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27 M.C. Joshi, "Historical Urbanization in Indo-Pak Sub-continent", in A. Roy and S. Mukharjee (eds), *Historical Archaeology of India, A dialogue between Historian and Archaeologist*, New Delhi, 1990, pp. 13-19.

(ii) What are the urban features of excavated sites? Whether the urban features are existed with the present excavated sites or not;

(iii) Urban growth of Orissa is a continuous process from earlier establishment or a sudden development;

(iv) Whether terracotta ring wells is a trait of urbanization or not.

For the above said objective of the study, we have employed some methods of study in a process, i.e. (i) Method of retrieving the data; (ii) Method of interpretation. In the data collection, we were engaged in extensive field work, photography and personal communication and questionnaire method. In this process, so many eye sketches and drawings were prepared to know the things in post field work period. Finally in the next stage, i.e. interpretation part, we were engaged in collecting the ethno-graphic data from a specific region where ring-wells making are still living practices. They are properly documented and through direct participation some important questions were also solved. Most of the earlier excavated sites and their plan and drawing were taken up for interpretation through consulting different published journals, bulletins articles and books.

Finally, all these collected data and their interpretation are arranged in a systematic way to understand Indian urbanization and ring wells in general and Orissa in particular. Hence, all these are arranged in altogether five chapters. Chapter-I deals with general

introduction to the topic; Chapter-II deals with Urbanization, its features, growth, literary reference of terracotta ring wells, distribution of ring wells with its antiquity and chronology in India; Chapter-III narrates the technical aspects of ring wells along with earlier established views of different authors on the basis of their excavations; Chapter- IV speaks about the ring wells in Orissa and a case study of ring wells is given here; and finally Chapter-V incorporate the sum up views in a form of conclusion.

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CHAPTER – II

RING WELLS IN INDIA :

A HISTORICAL PERSPECTIVE

RING WELLS IN INDIA: A HISTORICAL PERSPECTIVE

Ring well, though its full-fledged attributes and function had emerged in a late stage, is very often associated with the historical urbanization.[1] In India, so like ring wells, every traits of a culture and its associated materials are the creation of men's advancement towards attainment of perfection. Different explanations are there to understand culture, urbanization, civilization and so on. As ring wells associated with urbanization, it is essential to understand the different aspects of urbanization, nature of city and its various aspects defined by various authors.

Here an attempt has been made to define city, its planning, rural-urban disparities, and factors for the growth of city culture or urban centers and their characteristics to understand the process of urban growth. As such, 'City'[2] the name is given to a certain urban communities in English- speaking countries by virtue of some legal or conventional distinction. It also refers to a particular type of community, the urban community and its generic culture.

As a type of community, the city may be regarded as a relatively permanent concentration of population, together with its diverse habitation, social arrangements and supporting activities, occupying a more or less discrete site, and having a cultural importance which differentiates it from other types of human settlement and association. In its elementary functions and rudimentary characteristics, however, a city is not clearly distinguishable from a town or even a large village. Mere size of population, surface area or density of settlement is not in themselves sufficient criteria of distinction. But many of their social

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1 T.N. Roy, *The Ganges Civilizations*, New Delhi, 1983, P.45.

2 *Encyclopaedia Britannica*, Vol-5, William Benton, 1973, p.809.

correlates (division of labour, non agricultural activity, central-place functions and creativity) also characterize in varying degree all urban communities from the small country town to the giant metropolis.

While many cities have been deliberately settled functions by potentates or colonizers, others have "just grown". During their 7,000 year history, cities have been populated by clans, families, and individuals; they have been patterned in rectangular, oval and irregular forms. Cities have variously functioned[3] as temples, fortress, capitals, markets and factories and have provided a locus for agricultural, commercial, manufacturing and a host of specialized service activities. As a consequence, city life has given rise to a variety of social structures and personality-types. The city and its hinterland are usually interdependent. The countryside focuses its life and activity upon that of a central city which, in turn, encompasses the diversity of the hinterland.

The early evolution of urban communities occurred between the 6th and the 1st millennium B.C. in widely separated parts of Southern Asia.[4] Their origin seems rooted in a Neolithic transformation which resulted in the introduction of cereal agriculture (wheat and millet) some time after 10,000 BC. Dependence on corps required a more orderly and permanent mode of settlement under comparatively restricted conditions of environment. A stable community of stone-using people eating semi-cultivated wheat, but without pottery or metallurgy, existed at Jarmo in east-central Mesopotamia about 5,000 BC. A social architectural prototype with houses and walls was situated at Jerico and Jermo(Palestine) at about the same time[5]. The subsequent transmission from agricultural village to larger cities (as revealed by

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3 *Ibid*, p.810.

4 D.P. Agarwal and J.S. Kharakwal, *Bronze and Iron Ages in South Asia*, Aryan Book International, New Delhi, 2003, p.120.

5 I.K.Sharma, *Roots of Indian Civilization*, New Delhi, 2000, pp.109-127.

radio carbon dating) was quite rapid. By the 3,000BC, urban population was distinguished by literary, technological progress (notably in metals), social control, political organization and emotional focus. Such places, dated by historical means, existed on the Sumerian coast at Ur and in the Indus valley at Mohenjodaro during the 3rd millennium BC. Before 2000 BC, this development appeared in the Nile and Wei-ho valleys. Cities proliferated along overland trade routes from Turkistan to the Caspian and then to the Persian Gulf and eastern-Mediterranean. Their economic base in agriculture and trade and their political-religious institutions had made for an unprecedented degree of occupational specialization and social stratification. From central vantage point, cities already gave some coherence and direction to life and society in their hinterlands.

The growth of cities, however, was by no means the inevitable outcome of a succession from barbarism to civilization.[6]

About the planning and location of the city, B.B.Dutta[7] mentions that a city, as a concrete expression of the motive forces and ideas regulating the life of the citizens, is the noblest monument of human art and concept. Any locality bidding fair to grow into a town must be endowed with advantages of a market or temple, facilities of easy access and conveyance especially by water (prominent trade route, navigable rivers, or seas). This is true for all towns, whether in India or abroad.

B.B.Dutta in his book *Town Planning in Ancient India* mentions that, *Savdakalpadruma* gives the following synonyms of *puram,* the Sanskrit equivalent of a city: a house (*grha*); a place containing a

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6 *Ibid*, p.120.

7 B.B.Dutta, *Town Planning in Ancient India*, Calcutta, 1925, pp.18-43.

market and the like (*hattadi-visishta-sthanam*) a place of palaces or royal residence (*puri*); a town (*nagara*); an emporium (*pattanam*); a camp (*katakam*); a crossing of great high way (*pattam*), a commercial centre (*nigama*). A close study of above synonyms will reveal the history and explain the origin and characteristics of Indo-Aryan cities.

It should be noticed that the origin of those towns which grew independently of any deliberate planning from the beginning, can be traced to a house, a temple, a village, or a market and to natural advantage of the locality such as an island, a river bed, a sea-coast, a mountain valley and the like.

River sites, sea coast, especially the mouths of rivers offer the best facilities for the origin and growth of cities, because a river is not only a means of communication with the interior of the country, a way of transport and locomotion, but it also offers an outlet unto the outer world, thus fostering and encouraging commerce.

Hence, the first Indo-Aryan colonies were planted on the valleys of the Indus and the Ganges. Besides, a coast belt, a river side, is as easy of defense in times of war as of access in time of peace. These have also a never failing sanitary importance. These reasons along with local advantages lead to the evolution of the Indo-Aryan settlements in the shape of riparian towns. It was observed that, it was an orthodox rule to establish towns on the right bank of a river.

A temple city, especially in south India, corresponds to that of an Indo-Aryan village or town in its salient features. Every temple is well provided with reservoirs, wells, tanks, drains, granaries, stalls and even markets. Even as the royal castle is erected on the bank of a large tank round which the city grows. So in front of the temple is a small bathing *ghat* of a tank the water of which is held sacred.

An Indo-Aryan town is nothing but a congregation of villages and its cause is the political condition of ancient India. Like other cities, Pataliputra itself was an aggregation of Indian villages joined together by specious parks (the sacred groves) and stately avenues.[8]

There are different explanations for urban development. It appears that while some scholars consider the social factors responsible for urban growth, others are placing the economic and political factors. But none of these three was independently sufficient enough to transform a rural settlement into an urban centre. So an isolated factor is not capable of giving birth to a system/organization/institution. Thus each of the elements-economic, social and political- played an important role in the growth and sustenance of towns. Besides the economic, social and political causes, such factors like geographical and religious ones also influenced the course of urbanization in ancient India.

All the urban centres were not the result of one single set of causes but most of them originated in diverse circumstances and due to specific causes. The primary factors like the existence of a surplus and distributive machinery representing both the traders and administrator were, no doubt, common to all of them. But they derive their rationale for existence from such diverse causes as- religion, marketing etc. Some of the towns were religious centres, some were trade centres, some were educational centres, and some were centres of administration, and so on. Even though, there were numerous towns performing more than one functions at the same time.

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[8] E.B.Havell, *Ancient and Medieval Architecture*, p.24.

Some of the important causative factors[9] which seem to have influenced urban growth are as follows—

1. An increased food supply, 2. Increased in population and/or rural unemployment, 3. Craft specialization, 4. Marketing and trade, 5. Social stratification, 6. Religion, 7. Secular tourism, 8. Education, 9. Land lord, 10. Retainers, 11. Administration, 12. Defence, 13. Warfare, 14.Irrigation, 15. Geographical location and 16. Individual initiative.

The above survey indicates that urban growth can not be explained by a single factor. The emergence of towns in early historical India roughly synchronizes with the beginning of the NBPW culture. The NBPW started appearing at north Indian sites from the 6th Cen. BC., although at some sites it has a somewhat later origin (Cir.350-150BC.)

The city has been variously defined,[10] but its broad distinguishing features are that i) Its population is denser than the rural areas and is settled in a restricted area. ii) Only a limited part of its area, if any at all, is utilized for agricultural purposes. iii) Its population is predominantly non-agricultural in occupation and is dependant on rural areas for the supply of food and raw materials. iv) A greater diversity of occupation is not necessarily a feature of the city, for there may be cities with specialized functions, where this can not be a feature. Thus a city may be a political and administrative centre, a centre of trade and commerce and the third one is a religious centre.

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9 V.K.Thakur, *Urbanization in Ancient India*, New Delhi, 1981, pp.46-87.

10 A Ghosh, *The City in Early Historical India*, Indian Institute of Advance study, Simla, 1973, p.18.

It is evident that a mere increase in the population of a village would not turn a village into a city, unless it is accompanied by other changes.[11]

It has been said by many writers that a society must built up a surplus of food-stuff before it can have a city. Improved agricultural technology- the plough, the wheeled-cart and irrigation gave the Bronze Age society the surplus to other non-food-producing populations of the city like the temple priest, the artisans, the attendants and administrators. Such an accumulation, says Childe, "was a precondition for the growth of the village into a city".[12]

Thus it has been observed that that the new agriculture (by the plough in the Iron Age) led to the production of a surplus on a scale which could not be attained with stone or copper implements. This prepared the ground for the rise of urban settlements in north-eastern India around 600BC.[13] More than a surplus or even the capacity to produce a surplus, what is required is a socio-political institution to force or induce the farmer to produce a surplus. For maintenance and management, an administrative authority is required and by commercial means a mercantile system is called for. As between the rulers and merchant, the credit for the establishment of cities has been given to the former. According to Sjoberg[14], "urban growth in societies is correlated with the consolidation or an explanation of a political apparatus which ultimately resulted a kingdom or an empire".

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11 Arnold Toynbee(ed.), *Cities of Destiny*, London,1967, p.13

12 V.Gordon Childe, *Man Makes Himself*, London,1965,p109

13 R.S. Sharma, "Material background for the rise of Buddhism", Mohit sen and M.B. Rao(eds.), *Das Capital Centenary Volume- A Symposium*, Delhi-Bombay,1968,p.61

14 Gideon Sjoberg, *The Pre Industrial City of Past and Present*, New York, 1960, pp69-75.

So there is a great debate on the criteria for evolving a city. However, Childe, lays down the following ten abstract criteria ('abstract' because their concrete manifestations were different in each civilization) to distinguish the earliest city from any older or contemporary village.[15] These are (1) size of cities, (2) peasants cultivating lands out side the city and having non-food producing classes, (3) each primary producer paid his tiny surplus to a deity or divine king, (4) truly monumental building, (5) priest, civil and military leaders officials absorbed a major share of the concentrated surplus and formed a 'ruling class', (6) the ruling class was compelled to invent system of recording and development of science. Writing is thus a significant as well as a common trait, (7) other specialist gave a new direction to artistic expression, (8) Introduction of invasion of arithmetic, geometry and astronomy, (9) regular 'foreign trade' over quite long distance, (10) in a city specialized craftsmen were provided with raw materials needed for the employment of their skill.

However, the first criterion, namely the relative size and density of population of the city is obvious and is in very definition of the city.

About the ecological theory of the pattern of land used in the city, study is based on the pattern of Chicago, which gives a zone wise division of a city i.e. zone-I to zone-V for central business district, zone of transition and degeneration, workmen's homes and factories, residence of white collared workers and professionals, zone of commuters of suburbs propounded in 1925. This theory has undergone modifications from time to time[16], but the fundamental principle underlying it- that of concentric zone- has remained unaltered. It has

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15 V. Gordon Childe, "The Urban Revolution", *The Town planning Journal*, Liverpoole, 1950, pp3-17.

16 Leonard Reissman, *The Urban Process- Cities in Industrial Societies*, New-York, 1964, pp105-110.

also fault in it. According to Sjoberg[17], three pattern of land use in pre-industrial cities different them from industrial ones.

The introduction of metallurgy had a consequence which has been noted by Margaret A. Murray.[18] She points out that the users of metal arms had military superiority over the users of crude stone weapons. Neolithic folks who did not know how to make weapons from copper, bronze or iron, were easy prey to invaders armed with metal weapons. The invaders then moved into the territory of the peasants, who became their serfs. The overlords, to secure their rule, selected settlement places. It is postulated that the first cities were originated in the metal age.[19] On the other hand, some scholars hold that the first cities were primitive villages that gradually grew into urban centres.[20]

Ghosh, however, says that in the early historical periods, there was no large scale drift to the city. The vast population continued to be rural, and nothing altered the predominantly rural character of the land. His only criteria for calling a period urban, is the large scale rural urban migration.[21] While dealing with ancient urbanization, he tries to impose the features of a modern urban society because in pre- industrial era there was not any large scale drift to the city. In the Indian context society was mainly rural, and the rural element was quite strong even within the city.[22]

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17 Sjoberg, *op.cit*,(1960),pp95-96.

18 M.A.Murray, *The Splendor that was Egypt*, P.4.

19 Niles Carpenter, *The Sociology of City Life*, p.2.

20 L F Thomas, *The city*, p19.

21 A. Ghosh, *City in Early Historical India*, pp7-10.

22 *Ibid*, pp15-18.

Mumford has clearly shown that even the Greek cities of the fifth-fourth Cen. BC were quite close to the rural way.[23] In-fact, it seems quite natural that the urbanism of the pre industrial era was fully dominated by the rural spirit. Max Weber is too explicit on this point to remark that the urbanite of antiquity was semi peasant.[24]

The beginning of urbanization in India goes back to 2350 BC in the Indus valley region.[25] Prior to this settlement, there is sufficient archaeological evidence of Palaeolithic and Neolithic settlements in north, central and south India and in the border areas of Baluchisthan and Afghanistan. In all these areas there is clear evidence of practice of agriculture, domestication of animals, and wheel made pottery and tools. It is at this stage that the cultural and technological developments and the larger village settlements showed distinct urban attributes, thus ushering in an era of urbanization. [26]

The origin of the earliest cities is based on the archaeological evidence, obtained from different excavations of the early settlements. From the archaeological evidence we can get certain idea of the physical aspect of city developments such as-the extent, the system of town planning and the type of material used in building activities, domestication and so on. However, there is no literary evidence in the support of the origin of the earliest cities.

Indian urbanism has essentially been shaped by three urbanizations—the Hindu during ancient period, the Muslim during

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23 Lewis Mumford, *Cultures of Cities*, p.3.

24 Max Weber, *The city*, p7.

25 R.Ramachandran, *Urbanization and Urban System in India*, p.24.

26 *Ibid*, p25.

medieval period and the Christian during modern period.[27] Without a simplification of the time periods of analysis it is difficult to describe the history of Indian urbanization. For the sake of convenience the urban history of India has been divided in to certain periods, the proto-historic period (2350-1800BC), the early historic period (600BC-500AD) and the medieval period (600-1800AD).[28]

Here it is essential to show the difference between the type of urbanism flourished in Bronze Age culture of Harappa and the Iron Age culture in the middle Ganga plain[29]. There are basic differences between these two and the important one is geographical or ecological; the Harappa area is an arid or semi arid zone without much rainfall where as Gangetic area had heavy rainfall. Another important difference is the use of money. In India, so far as the actual coins are concerned, they are not earlier than 500BC[30]. In the middle Ganga plain coins become associated with the towns on a considerable scale. Other difference is the duration. The Harappan urbanism lasted shorter than the urbanism in the middle Ganga plains. There are also marked differences in irrigation system and water management system in these two regions.

The Harappan culture was distinguished by its system of town-planning and for other traits. The total picture and scale of urbanization in the Harappan civilization is yet to emerge as newer sites are discovered and investigations made. The Harappan areas consisted of a few large cities, a number of smaller towns and a large number of rural villages. The archaeological evidences clearly define the relations

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27 M.S.A.Rao, C.Bhat, L.N.Kadekar, *A Reader in Urban Sociology*, p21.

28 R. Ramachandran, *op.cit*,(1989), p24.

29 R.S Sharma, "Urbanism in Early Historic India", Indu Banga(ed.), *The City in Indian History, Urban Demography, Society and Politics*, p.9.

30 *Ibid*, p.11.

between urban centres and the villages. Recent works throw significant light on the nature of the material culture of the Harappan civilization. The excavations in Haryana, Rajasthan and Gujrat have reavealed that the urban culture of the Harappan town was of composite character. The settlement pattern, brick architecture, pottery, seals, script, weights and measure are all dominating the life of the Harrapan people. The emergence of the earliest cities generated a little tradition based on common beliefs and mythology, which united rural and urban society.[31]

After the end of Harappan culture and cities, no urban development took place in any part of India. But around 600BC the second phase of urbanization began in India[32] in the upper Gangetic area. Excavations and explorations have brought to light nearly 500 sites inhabited for the first time. These are called Painted Grey Ware (PGW) sites, because they were inhabited by people who used earthen bowls and dishes made of painted grey pottery. They also used iron weapons23. Slowly, from upper Gangetic plains they expanded over Ganga-Yamuna Doab region. By 600BC a number of settlements were established in the different parts of India. The early historic urbanization reached its peak between 200BC to AD300 in India. Near about, 130 excavated sites of this period have come into existence from different parts of India.[33] These sites were prosperous in terms of artifacts and structures.

In the texts like *Dharmasastra* and *Dharmasutras* belonging to the period from 600 to 300BC, reference are made to the growth of urban places. The *Arthasastra* of Kautilya provide ample evidence regarding

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31 J.P.Joshi, "Exploration in Kutch and Excavation at Surkotoda and New light on Harappan migration", *JOBI*-Vol.XXIII, 1986, p.25.

32 V.K. Thakur, "The Concept of Urban Revolution- A theoretical study of the second urbanization of India", U.Thakur(ed.), *The Heritage of India*, pp321-24.

33 N.Ray, "Technology and Social Change in Early Indian History-A note posing a theoretical question", *Puratattva*,no.8,pp132-38.

the rise and development of urban centres during the pre-Mauryan and Mauryan periods. The great epics like the Ramayana and the Mahabharata, and the *Kamasutra* of Vatsayana, *Mahabhasya* of Patanjali, *Manusmriti* and the *Puranas* provide detailed information of urbanization during the post-Mauryan phase. Besides these, the travel accounts of Fa-hien and Meghasthenese and the archaeological excavations provide far more convincing evidence of urbanization during this period. They established small territories which led to the emergence of kingdoms and capital cities[34]. The earliest cities of this period were Hastinapura, Sravasti, Kapilavastu, Ujjain, Mahismati, Champa, Rajgir, Ayodhya, Varanasi, Kausambi and others.

From the 6th Cen. BC, the wide spread use of iron was important for settling the stage for urbanization[35]. In eastern Uttar Pradesh and western Bihar various territorial states[36] or *Janapadas* were formed. Among these Magadha, Kosala, Vatsa, Avanti, Kasi, Malla, Panchala, Kamboja, Kuru, Gandhara, Chedi were famous. During the Mauryan period the complexity of urbanization is indicated by the presence of different types of towns[37]. From Buddhist texts we get some reference of various cities. The most important towns were - *Rajadhaniyanagar*, *sthaniyanagar*, *kharvata*, *nigama*, *patina* and *mukhi* etc. The first three are the administrative towns and the last three are of commercial cities. In addition, there were cities of permanent character, specialized centre of learning and religion, art and crafts and medicine. *Arthasastra* of Kautilya mentions detail about the internal structure and urban administration of capital cities. Mauryan cities were also a centre of the

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34 R,.S. Sharma, "Urbanism in Early Historic India", *op.cit*, p.13.

35 Romila Thapar, *Ancient Indian Social History,* pp43-44.

36 V.K.Thakur, *Urbanization in Ancient India*", pp.1-21.

37 R.C.Majumdar, *Ancient India*, pp95-96.

manufacturing industry. In addition, the city was surrounded by craft villages.

After Mauryans, most of the towns emerged in the Kusana period in the 1st and 2nd Cen. AD. Excavations show that several sites in Bihar[38] like Chirand, Sonepur and Buxar witnessed prosperous Kusana phase. In Uttar Pradesh, Sohagoura, Bhita, Kausambi and several sites in the district of Meerut and Muzaffarnagar were well represented in Kusana times. As a whole, material remains of Kusana phase display urbanization at its peak. Town prospered during Kusana period because of trade with the Roman empire.[39] But its end in the 3rd Cen. AD gave a blow to the growth of towns.

Around 5th Cen. AD cities and urban way of life began to decline. This fact is described by Fa-hien and Hsuan-Tsang, who visited India during 5th and 7th Cen. AD respectively. The literary accounts describe the utter ruin and abandonment of a number of well known cities of the earlier period. Taxila, Mathura, Sravasti, Kausambi and Pataliputra were in a state of decline during this period.[40]

The reasons for the decline of urban centre in the post-Mauryan period are many and varied. These are the frequent occurrence of natural calamities (faminies, pestilence, earthquakes), political factors, foreign invasions (particularly, Hunas, internal wars between feudal chiefs), religious (rise and fall of Buddhism) and fall of the Roman Empire (trade decline) are the causes of the downfall of the urban centre. Urbanization in this phase (second) had largely been confined

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38 B.B.Dutta, *Town planning in Ancient* India, pp272-85.

39 K.Prasad, "The Kusana Influence in Bihar: An Archaeological Study", *PIHC*,p.45.

40 K.Prasad, "Urban occupations and crafts in the Kusana period", *PIHC*,Vol-II, pp113-115.

to the North India. However, during this period in the extreme southern part of India which comprises the two states of Tamil Nadu and Kerala witnessed and independent process of urbanization resulting in the emergence of a number of trade centres and towns.[41] The important Tamil cities of the early period were Madurai, Vengi, Urayur, Puhar and Korkai which served as the capital cities of the Tamil Kingdoms of the Pandyas, Cholas and Cheras[42]. The Greek ambassador Meghasthenese and Kautilya's *Arthasastra* also refer to the flourishing urban centres in this region and had a trade relation between Mauryan Empire and the cities of Madurai and Kanchipuram in the 3rd Cen. BC.[43]

The most important of the native successors of the Mauryas in the Deccan and in central India were the Satvahanas. They were powerful and had contacts with the north. Several towns of the 2nd and 3rd centuries in these areas are known from inscriptions and excavations.[44] Tagar(Ter), Paithan, Amaravati, Nagarjunikonda, Broach, Sopara, Arikamedu, Kaveripattinam were prosperous towns in the Satavahana period in western and southern India. Several Satavahana settlements, may be identical with thirty walled towns of Andhras mentioned by Pliny. However, the decline of towns in Maharastra, Andhra and Tamil Nadu, generally took place from the 3rd Cen. AD onwards.[45] Archaeological excavations in the Deccan also suggest decline in the urban settlements after the Satavahana phase.

Over all, in the later Vedic period (after 6th Cen. BC), two major areas were prominent-in the north it is middle Ganga valley and in the

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41 R.S.Sharma, *Urban Decay in India (300-1000)*, pp29-33.

42 K.Pillai, *The Tamils Eighteen Hundred Years Ago*, pp148-152.

43 K.P.Velayudhan, "The impact of Roman trade on ancient Tamilakam", *Indian Express*, 29th April, 1962.

44 K.A.Nilakantha Sastri, *A History of South India*, pp30-72.

45 *Ibid*, pp30-72.

south it was the Tamil country. But during the Mauryan period, urbanization spread to lower Ganga valley, Orissa, Gujrat and Maharastra. Cities like Nasik, Puri, Cuttack, Broach, Ujjayini, Machhilipatinam served as a link between northern and southern urban centres. A few towns are found in coastal Orissa which are termed as urban centres. Jaugada[46] in the Ganjam district is known for a set of the fourteen rock edicts of Asoka and a full-fledged iron using culture. Another town was Sisupalgarh[47], very close to Bhubaneswar, representing Tosali of Asoka's Dhauli Edicts and Kalinganagari of Kharavela's Hatigumpha inscription. The coastal areas of West Bengal show a couple of towns in early historic times. Tamluk[48], identical with the ancient port town Tamralipti, lies in Midnapur district. Chandraketugarh[49] in 24-Praganas district was an ancient port-town on the coast of Bengal. The excavated sites in Orissa and West Bengal show the beginning of urbanization around 200BC and its end around 300AD.

Urbanization had a deep impact on rural life in different ways. There was a huge migration of skilled craftsmen from village to towns. There was also the migration of people from rural areas to urban centres to provide for the sanitary services, and labourers to work on constructional activities in capital cities. The villages around the market towns and ports had an impact in the nature of commercialization of crops and were thus drawn into the network of regional and even international markets. Villages supplied several consumer goods to

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46 *IAR*, 1956-57,p30

47 B.B Lal, " Sisupalgarh 1948, An Early Historical Fort in Eastern India", *Ancient India,* No.5, pp62-105.

48 *IAR*, 1954-55, p.20; 1973-74, p.33.

49 K.G.Goswami, "Chandraketugarh, and Its Archaeological Importance", *Indian Museum Bulletin,* no-1, pp.42-46.

towns and in return received their daily needs. Thus towns and villages formed the part of civilization process.

The rapid growth of urban centres in India is largely attributed to the merchants and their guilds. It should be noted that in north Indian urbanization had commenced many centuries earlier than it happened in the south. The reason is to be seen in the different historical background and in the uneven character of the socio-economic development in the two parts of India. The maximum development of guilds in the north occurred before the 6th Cen. AD and thereafter we notice the decline of merchant guilds and urban centres. In the south, however, we find the maximum development of trade guilds during the 6th Cen. AD. The activities of the merchant guilds were not confined to creation of towns and cities but in some cases they contributed a lot for the development of trade and commerce. Some records clearly state that the merchant guilds were the founder of certain towns and cities.

The phenomenon of urbanization[50] is no longer to be judged in terms of the hypothesis that the Harappan urban growth was the result of Mesopotamian or Elamite influence and that the early historic urban growth owed itself to the Achaemenid impact. In the Harappan context the fundamental problem lies in the transition from the "early Harappan" to the "mature Harappan". On the whole, what Rafiq Mughal wrote, "on present evidence the mature Harappan culture at early Indus or Harappan sites arrives with a fully developed mature culture. Does the sudden change mark a major shift in the socio-political structure of the Indus people? If so, what were the circumstances in which such a change occurred? At present we have no evidence to answer this pertinent question".

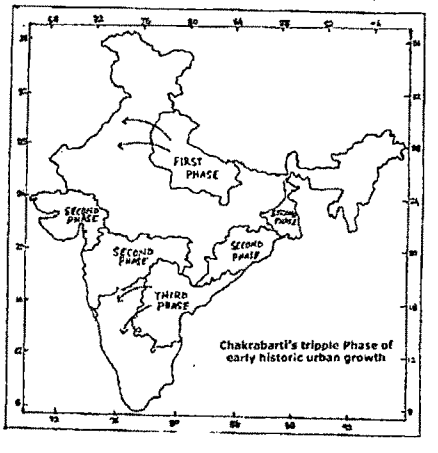
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[50] M.R.Mughal, *Present State of Research on the Indus valley Civilization*, Karachi, 1973, p.55.

Later on, D. K. Chakrabarti argued that this change was "basically in the socio-institutional sphere, giving the earlier village horizon a new, qualitatively different dimension".[51]

In the context of early historic period, there are at least three issues. First, the period between the end of the Indus civilization and the beginning of early historical cities. Secondly, there is some possibility of the beginning of urban growth in the Doab in the Painted Grey Ware (PGW) level itself.[52] Thirdly, there is nothing sacrosanct about the date of 600BC being the date of the beginning of the early historic period in the Indo-Gangetic divide and Gangetic valley associated with the NBPW (Sringverpura-the date of NBPW is 700BC).

Again D. K. Chakrabarti argued for the three main phases of early historic urban growth of India.[53] The first phase was originally in the middle Gangetic valley and Malwa, spreading soon in the upper region and extending to the north-west. The second phase, equated with the Mauryan period, showed its expansion in such areas as West Bengal, Orissa, Gujrat and Maharastra, etc. and consolidation of the urban base in the areas covered during the first phase. The third phase falls in the early centuries AD, shows its beginning of the urban growth in the Andhra and southern region.



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51 D.K.Chakrabarti, "Concept of Urban Revolution and the Indian Context," *Puratattva-6*, 1972-73, pp27-32.

52 M.Lal, *Settlement History and Rise of Civilization in the Ganga-Yamuna Doab from 1500 BC- 300AD*, Delhi, 1984, p.85.

53 D.K.Chakrabarti, "Some Theoretical Aspects of Early Indian Urban Growth," *Puratattva-7*, 1974, pp.87-89.

It is also hypothesized by Chakrabarti that the causative factors of the early historic urban growth lay principally in the formation of states or organized political unit in the northern India, as reflected in the sixteen *Mahajanapadas* or major principalities

But in contrary to this, Kethleen Kenyon and James Milaart based on their work at Jerico and Katal Hyuk respectively opine that the society concerned were familier with the art of writing. The clues to urbanism in archaeological record rest on the changing settlement patterns of the relevant region and not on the occurrence of the burnt bricks in excavations.[54]

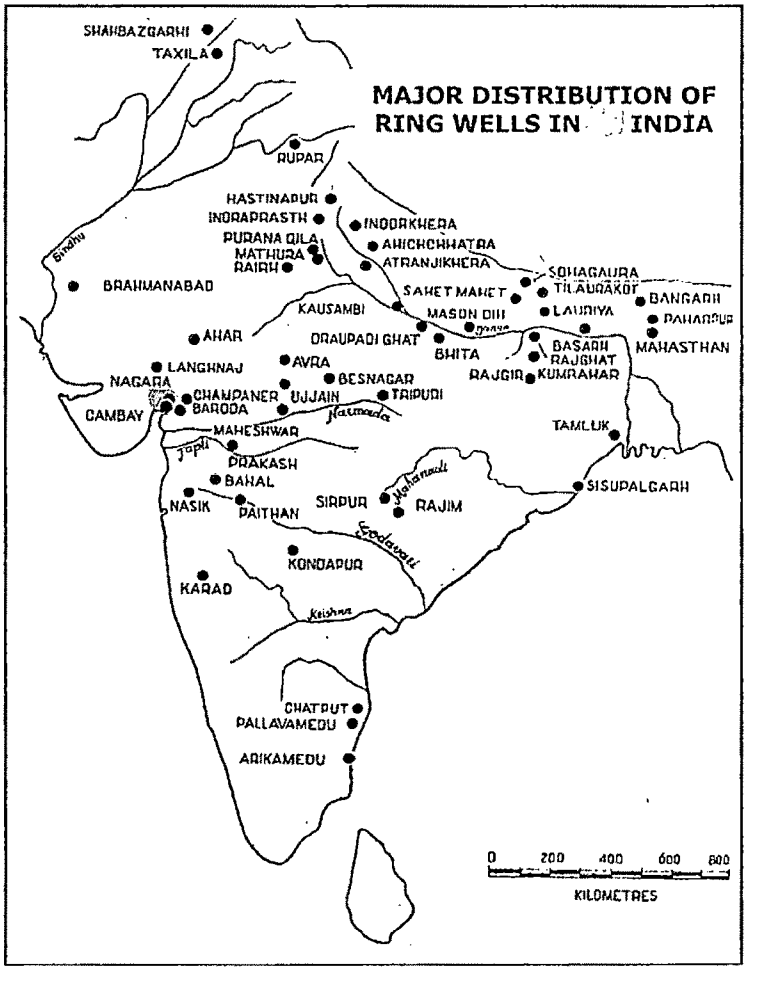
George Erdosy's[55] work on settlement archaeology in the Kausambi region leads to conclude that, the origin and nature of early historic urban centres were a result of the political climate generated by the rise and rivalry of states in the Ganga valley and the economic developments that followed as a result of the political situation. However, Chakrabarti argued that the early historic urban centres in India were possible only with a strong political framework which is clear from the way its three major phases are related to the three most important political stages in early historic India i.e. the periods of the sixteen major principalities during the time of Buddha, the Mauryans and the Kusanas. Secondly, there is nothing in the archaeological record to indicate that any other factor (e.g. - technology, trade, etc.) became critically significant prior to the formation of the cities during these periods.

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54 R.S.Sharma, "The Decay of the Gangetic Towns" in his paper in Muzaffarpur History Congress, p.76.

55 G. Erdosy, "Settlement Archaeology of Kausambi Region," *Man and Environment*-9: 1985, pp.66-79.

However, there are various theories regarding the emergence of urbanization and different process of its growth. So many authors have given their views on urbanization - its factors, its growth, process and decline. But in archaeological terms the only cognizable to identify a town may be terracotta ring wells, which seems to have mainly served the purpose of soak-pits within or even outside the houses.[56] How far this statement is applicable to the identification of a town having urban character is a matter of scrutiny. In this regard, we can look to the urban cities in a different angle, where ring wells have a prominent role in shaping the urban character of a particular settlement.



56 M.C.Joshi, "Historical Urbanization in Indo-Pak Subcontinent: A reassessment", A. Roy and S. Mukharjee(eds.),*Historical Archaeology of India, A Dialogue between Historian and Archaeologist,* Delhi, 1990, p.16.

After discussing all these facts about urbanization, a distribution of ring well throughout India is given here to know its location, associated finds and other details to understand the technical aspects of ring wells. In India so many sites having ring wells are reported through archaeological excavations and explorations. These are given below.

1. Sonpur, Dist. Gaya (Bihar):

Period I – Chololithic; and Period II – witnessed the use of iron. The inhabitants[57] continued to live in houses of wattle and daub, but they seem to have used bigger logs as posts. A noteworthy discovery of the period was that of a terracotta ring wells having 37 rings. Although the main ceramic industry was the NBPW, Black- and- Red, Black, Red-and-Grey wares were also vogue. The other finds include objects of iron and copper, beads of terracotta and semi precious stones, punch-marked and cast coin.

2. Purana Quila (Delhi)

The Excavation[58] confirmed the cultural sequence (from Mauryan to Muslim period). The Mauryan period was marked by the use of NBPW. In the area under excavation, the deposits of the period were found to overlie the natural soil. The structural remains were represented by (i) a series of hearths and a wattle- and- daub structure (ii) drains of backed bricks of both rectangular and wedge- shaped variety, the latter perhaps intended to be used originally for the construction of a well or a similar circular structure (iii) House of mud brick. A significant feature of the period was the occurrence of terracotta ring wells, 75 cm in diameter. The technique of sinking these ring wells seems to have been follows:- an oblong pit with a narrow

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57 *IAR*,1970-71, pp.5-6.

58 *Ibid*, p.8.

rounded-end was dug to the required depth; the terracotta rings were thereafter fitted one above the other towards the rounded end by a workman standing in the remaining part of the pit; after the completion of the ring well, the pit was filled up to the brim.

3. Exploration in Dist. Nagpur (Maharastra):

At Mandhal[59], about 10 km to the South West of Chandala, was discovered an inconspicuous mound which yielded, on surface exploration, coins of Maharathis, Black-and-Red ware and remains of brick structures and soakage wells of the historical period.

4. Vasavasamudram, Dist. Chinglepet (Tamil Nadu):

The Excavation revealed[60] only one period of occupation, represented by a 1.92 m thick deposit. Two ring wells, located close to each other were exposed in the digging. It was gathered that a brick-lined pit with a drain had existed near the ring wells, which had been dug away by the land owner. The pottery obtained from excavation included the Rouletted Ware and amphorae jar. The site seems to have remained under occupation only for a short period (Cir. 2nd Cen. AD).

5. Kaveripatinam, Dist. Thanjavur (Tamil Nadu):

The pre- temple phase (Cen.10th to 12thCen. AD), is represented[61] here by two terracotta ring wells, sunk into the natural soil.

6. Sonkh, (Uttar Pradesh) :

While the upper building phase of level 23 seems to be the starting point for the stamp designed kusana pottery, the lower structure

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59 *Ibid*, p.24.

60 *Ibid*, p.33.

61 *Ibid*, p.35.

were of clear pre-Kusana origin. The size of the bricks changed from 37 X 23 X 5 cm in levels 16 to 22 of Kusana and Post-Kusana into 40 X 25 X 5 cm and 42 X 26 X 6 cm in the pre- Kusana level. There are several new features in the setting of wells and the erection of the roofs. From level 25 downwards, the gable shaped roofs had been covered with tiles. In level 25/26 a separate house with a ring well seen to indicate a joint water supply[62] for the community within the well. To the side of it, a votive tank in the shape of house with vaulted roof and a seal with *brahmi* script in a character of 1st Cen.BC are found. The pottery is all of pre-Kusana type.

7. Pallatharapallipuram, Dist. Alleppey (Kerala):

Ring wells,[63] were discovered by the Director of Arch., Kerala State, at Pallatharapallipuram in Taluk Shertallai. One of the ring wells went down to a depth of 1.6 m. and resembles those connected with the metallic remains in the mode of construction.

8. Pallavamedu, Dist. Kanchipuram (Tamil Nadu):

A trial dig[64] was made here by prevailing four successive structural periods, the lowest of which contained some fragmentary ring wells, co-eval with what purported to be an urn internment. Though a Pallava date for the site was not ruled out, no typical Pallava antiquities were recovered.

9. Rupar, Dist. Ambala, (Punjab):

The third period, commencing from the middle of the 1st millennium BC was characterized by the use of NBPW ware. Datable

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62 *Ibid*, pp.39-40.

63 *Ibid*, p.65.

64 *IAR*-1953-54,p.12.

materials established the chronology of the period on a finer ground than was possible for the two preceding ones. A unique find was a fame ivory seal inscribed with the word *bhodepalakala* in Mauryan *Brahmi.*

A perplexing discovery was a 12 ft. wide brick wall of this period, preserved to a height of 2 ½ ft and consisting of more than twelve courses. It was exposed to a length of about 250 ft., after which it was found to take curved forms at both ends. Apparently, it was an enclosure for some important edifice. Ring wells[65] were a feature of this period.

10. Prakash, Dist. West Khandesh (Maharastra):

Period-II (Cir. 5th Cen. BC) which began after a lapse of time, as indicated by a thin deposit of gravel at the site presented a full-fledged iron-using culture characterized by the use of the well-defined Black-and-Red ware in association with iron objects. The occurrence of sherds of the distinctive NBPW, towards the latter part of this period indicated intercourse with sites of comparable date in the Ganga-Yamuna valley and also provided a firm datum for fixing the chronology. Below the lowest occurrence of the NBPW, was a14 to 15 ft. thick deposit yielding the Black–and–Red Ware. Soakage-jars and a ring wells found in the period throw some light on the system of drainage prevalent in those days.[66]

11. Ahar, Dist. Udaipur, (Rajasthan):

From the single trench excavated,[67] the sequence of culture was not clear. The occupational deposit of over 30ft. represented two main cultures separated by a break. The first occupation over a thin sandy

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65 *Ibid*, p.7.

66 *IAR*, 1954-55, p.13.

67 *Ibid*, p.14.

deposit of natural soil underlain by rock beds of the Aravalli system. Its characteristic industry was a Black-and-Red ware. The ware had a long life at Ahar, and the thickness of 20ft., and could be divided into three phases. In the lowest phase the texture and fabric of the ware were rather course, and the pots were polished on the exterior only. In the middle phase, they become finer and were polished both inside and outside. In the final phase devolution in the ware appears to have set in. Throughout its occurrence the Black-and- Red Ware was associated with a plain Red Ware with incised designs on shoulders. In the upper level of this lower culture were found soak-wells lined with rings of baked clay, which have been found almost all over India at early historical sites.

12. Mathura, Uttar Pradesh:

First phase-(6th Cen. BC) and the second phase was characterized by the use of the NBPW and was divided into three sub-periods.[68] The earliest of them yielded remnants of bamboo-and-reed huts with scanty baked bricks, bone needles or styli, carnelian amulets and beads and figurines of mother-goddess in grey and animals, including dog, in red terracotta. Three ring wells also belong to this sub-period.

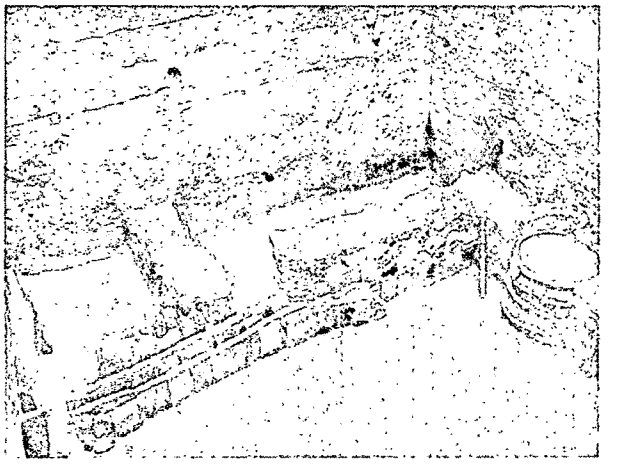


Plate-1 : Ring well at Mathura Courtesy IAR, 1954-55

The last sub-period saw a vigorous building activity in baked bricks. Three phases of a copper smith's furnace and workshop with

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68 *Ibid*, p.15.

several moulds, copper coins and beads of shells, glass and crystal were noticed. Though no plan of any house was found in the small area, there were well laid out walls, drains and ring-wells. The period came to close about the 2nd cen.BC.

13. Rajgir, Dist.Patna (Bihar):

A few trial trenches[69] were sunk in the high lands near Mariyar *matha* with a view to finding out the stratigraphical sequence relating to the introduction and disappearance of the NBPW at Rajgir. They however, failed to yield any substantial evidence, for the NBPW, associated with Black and fine Red wares, persisted from the third layer down to the natural rock. Remains of a residential building built of rubble in mud and datable to the earliest post-NBPW level were unearthed, along with a ring well and a circular masonry well. The other antiquities included iron nails, terracotta figurines and copper coins.

14. Tamluk, Dist. Midnapur, (West Bengal):

In period-III (Cir.1st-2nd Cen.AD), Tamluk[70] seems to have shared with other ports on the Indian coast trade contacts with Roman world, as witnessed by a sprinkler and the profuse occurrence of the Rouletted Ware, both believed to be ultimately originating from Rome. A brick built stepped tank exposed in one trench and a ring well and a soak-pit in

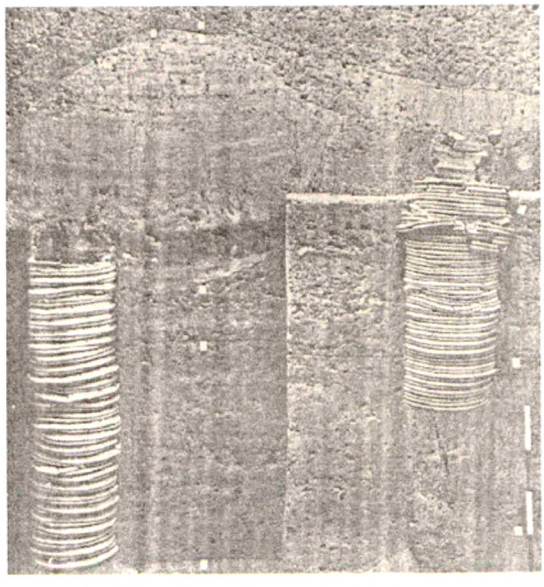


Plate-2 : Ring wells at Tamluk.
Courtesy-IAR. 1954-55.

69 *Ibid*, p.16.

70 *Ibid*, p.19.

another belonged to this period. Banded agate beads were also associated with this period.

15. Kasital, Dist. Kurukhetra, (Haryana):

It has three fold cultural sequence-(Period-I), characterized by the occurrence of PGW and besides a sherd of the Black-and-Red ware. In the structural remains, mention may be made of a circular barn[71] with 2.05m. in diameter and a mud wall with post holes.

16. Besnagar, Dist. Vidisa (Madhya Pradesh):

Five cultural periods, ranging from pre-Mauryan to the early medieval were recognized.

Period-I- belonging to pre-Mauryan to Mauryan times, is distinguished by the occurrence of the NBPW, Black Sliped Ware, Black-and-Red and plain Red wares. A few sherds of NBPW were also found revetted with copper nails. Structural remains consisted of ring wells, stone drains and bricks with semi circular holes.[72] Rooms are mud walled. Other antiquities consisted of iron objects, punch-marked and cast coins and a few terracotta objects.

17. Kanchipuram, (Tamil Nadu):

Excavations in two trenches in little Kanchipuram[73] behind the Varadarajaperumal temple, revealed the deposits belonging to the post-Pallava times. The ceramic industry is represented by red ware of the medieval period. The structural remains of the period consist of ring well in the uppermost level with its rings reached down to the natural soil. A tiny gold coin of the Vijayanagar period was found in the top level.

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71 *IAR*, 1975-76, p.17.

72 *Ibid*, p.31.

73 *Ibid*, p.39.

18. Batesvar, Dist. Agra (Uttar Pradesh):

The Excavation revealed four periods Period-II is marked by NBPW and thick Grey ware. Other noteworthy antiquities of the period include-terracotta objects, bangles, beads, pendants, net-sinkers, rattles, ear-studs and richly carved jewel box in bone. The structural remains of the period are represented by two mud brick walls of five courses laid in headers, two baked brick walls of twelve courses laid in headers. Post holes were observed at the ends of the floor. Besides, a ring well[74] and an oven were also encountered. The period is dated to 2520± 160 and floor levels (2590±160), on the basis of C^{14} test.

Period-III represented by Dull-red and Red Slipped Wares, besides a few sherds of the Red Polished Ware. Noteworthy finds of the period include terracotta human and animal figurines, bangles, beads, discs, pendants, votive tanks, shell bangles, stone caskets. Besides, a few copper coins were also recovered. The structural activity of the period is represented by four successive mud-rammed floors, laid on brick-jelly foundation, a well of baked-bricks (sizes 50x25x7 and 41x24x6 cm.) built over a foundation of rammed earth, and two ring wells were found. This period is dated to 6th Cen. AD.

19. Ayodhya, Dist. Faizabad (Uttar Pradesh):

The excavation revealed[75] a fairly compact and working sequence for the antiquity of the place from its first settlement over the natural soil. This began with the use of the well known NBPW and dated to Cir.7th Cen. BC.

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74 *Ibid*, p.42.

75 *Ibid*, p.52.

From its inception, the occupational phases of the mound appears to have continued upto the 3rd Cen.AD represented by several structural phases. In the earlier stages, the houses were of wattle-and-daub or mud, followed by those of baked bricks. In the *Janmabhumi* area, a massive wall of bricks was observed across the sector obliquely, which may perhaps be identified as a fortification wall. Immediately below this massive wall were found mud brick structures. In the upper levels of this phase, which may perhaps be called the post-rampart phase, extending from Cir.3rd Cen.BC to the 1st Cen.AD terracotta ring wells were noted. The fortification wall appears to have had a fairly deep ditch, almost like a moat, just on its exterior, which was partly cut into the natural soil overlying the fluvial sand bed. The other site, near Hanuman Garhi, yielded a good number of structures of the NBPW and in later periods, ring wells of more than one type, including the typical wells using wedge-shaped bricks found during the later part of the NBPW period.

20. Tumain, Dist.Guna, (Madhya Pradesh):

Period-I (Cir.5th -2nd Cen. BC.) and Period-II (Cir.2nd Cen.BC-1st Cen.AD.) was distinguished by the presence of mica-mixed ware. The frequency of the NBP and the Black-and Red Wares was reduced. Three Red Ware sherds were found to be painted with black horizontal and vertical bands. Of the structural remains of the period, mention may be made of houses of baked bricks and rammed floors of brick-bats, potsherds and gravel etc. At Tumain two ring wells were also exposed.[76]

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[76] *IAR*, 1971-72, p.28.

21. Koldihawa (Deoghat), Dist. Allahabad (Uttar Pradesh):

A cutting measuring 6.6m.was laid out on the western mound of the site.[77] For excavation purposes, this was further sub-divided into two small trenches designated as A1/A and A1/B. In the former trench, the excavation was carried down to the natural soil, which was reached at a depth of 1.22mtr.below the surface. The occupational strata comprised seven layers. In the later trench, however, digging was restricted to the upper two layers only. The cultural contents of layers 2 to 7 was Chalcolithic. In layer 2 were found structural remains, consisting of a floor made of rammed earth and burnt clods of clay enclosed by post holes. A cluster of complete pots in Red and Black-slipped Wares was found lying on the floor. Within the excavated area many refuse pits, with to varying depths of 29 to 110 cm, were also noticed.

22. Peddachepalli, Dist.Cuddapah, (Andhra Pradesh):

The early historical site yielded pottery including Black-and-Red, Red Polished and Red Wares. A ring well[78] was also noticed in a section of the mound.

23. Lothal (Saragwala), Dist.Ahmadabad (Gujrat):

The extent of the town must have been twice as large as that is indicated by the present mound. Within the excavated area, four streets, two running north-south and two others east-west and two lanes were exposed. Flanking one of the streets was a row of twelve houses with their bath rooms connected with a public drain. Two other houses stood on either side of another street with an underground drain. To dispose of sullage water, soakage jars were made use of. To ensure a quick

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77 *Ibid*, p.44.

78 *IAR*, 1977-78, p.76.

flow of water in the drain, drops were provided at regular intervals on its brick floor. Another interesting feature was the provision of a sluice gate at the mouth of the drain, where a wooden door could be slided in grooves.[79]

24. Sravasti, (Mahet), (Uttar Pradesh):

Period-II was marked by the coming up of a mud-rampart, which with a circuit of 3 miles, was laid roughly in the form of a crescent with the northern side overlooking the river Rapti. Of the rampart and other structures going with it, four sub-periods are noted. In the earliest sub-period, the rampart had a basal width of 95ft. the subsequent sub-periods were encountered by a pottery and ash dump on the outside and seemingly occupational debris with three terracotta soakage ring wells on the inside, suggesting that for sometime this part of the rampart had fallen into disuse.[80]

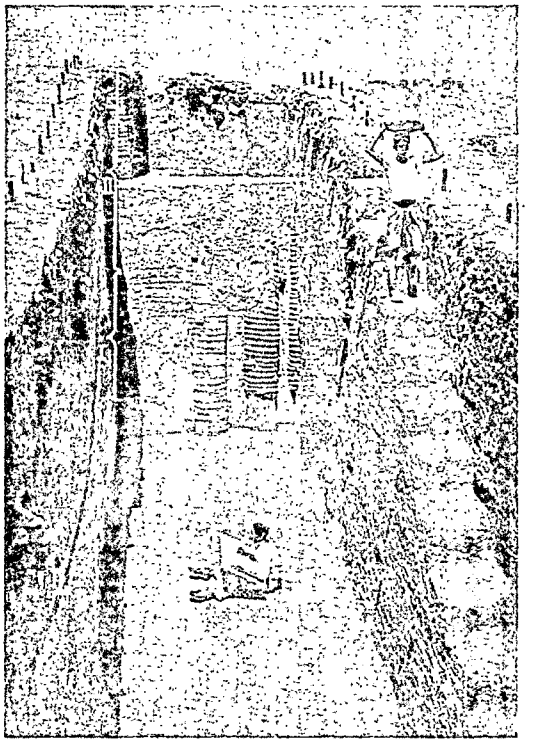


Plate-3 : Ring well at Sravasti. Countersy-IAR, 1977-78

The occurrence of Ayodhya coins and the seal referred to above in the upper levels of Period-II suggest for it a date from about middle of the 3rd to the middle of the 1st Cen.BC.

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79 *IAR*, 1958-59,pp.13-14.

80 *Ibid*, p.50.

25. Alamgirpur, Dist. Meerut, (Uttar Pradesh):

Period-III with an average thickness of less than a foot were confined to certain areas of the mound. The pottery of this period included the pear-shaped jars, jar with an externally flattened rim and vertical neck, cooking basin with a nail-headed rim and so on. Little evidence was obtained regarding the other industries of the period.

No structure was met with, but kiln-burnt bricks occurred in various sizes. Mud bricks are also noticed. Mention may also be made of an unlined soakage well[81] of this period. Period-III is late PGW or NBPW.

26. Nevasa, Dist. Ahmadnagar (Maharastra):

Period-IV (Early Historic or Satavahana) was characterized by sherds of the NBPW, Black-and-Red Ware and Megaron Ware, dated to the 1st cen.BC.

The houses of this period were built of bricks of large size and had wooden post for supporting roofs made of tiles provided with holes for inserting iron nails for fixing. The walls had hardly any foundation. The flooring was well made of lime and pounded hemp, occasionally rendered smooth by plastering. A barn, built of bricks, lay in a 12ft. deep pit, going down into the brownish silt, yielded abundant quantities of charred grains.

Period-V (Indo-Roman) - was marked by the use of amphorae and Red Polished Ware, suggesting a Roman association, besides Black-and-Red ware in smaller quantities. Furthermore, different antiquities both indigenous and foreign were found in this period. The

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81 *Ibid*, p.54.

houses were built of bricks and had solid foundations made of stones and black clay. Post holes were also noticed. The soak-pits[82] were built of terracotta rings or wedge-shaped bricks and some of them yielded burnt grains of bean, wheat etc.

27. Nagda, (Madhya Pradesh) :

Period-III had mud and mud-brick structures of modest proportions, with a limited use of burnt bricks. The pottery consisted of NBPW known to be associated with it at other sites, together with a variety of a Red Ware. This period is also marked by the occurrence of storage-jars.[83]

28. Ujjain (Madhya Pradesh):

Period-I with 20ft. thick strata, bore the NBPW and associated wares. The other antiquities of the period were- terracotta figurines, objects of copper and iron, pestles, potter's dabbers of stone. The structural remains[84] were of burnt bricks as well as roughly dressed stones. Ring wells were present.

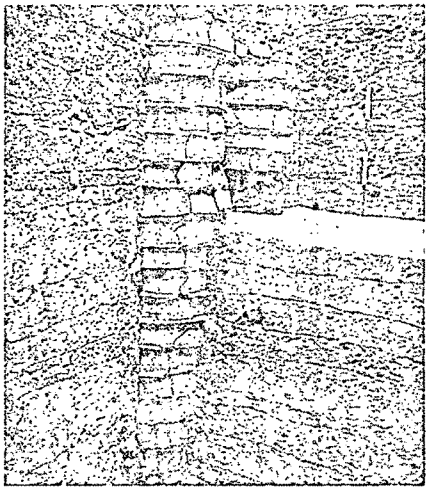


Plate-4 : Ring wells at Ujjain.
Courtesy-IAR, 1958-59

29. Kausambi, Dist.Allahbad (Uttar Pradesh):

The available evidence indicated a continuous occupation of the site from Cir.6th Cen. BC. to 6th Cen. AD, through sixteen successive phases of structural activities.

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82 *IAR*, 1955-56, p.11.

83 *Ibid*, p.14.

84 *Ibid*, p.19.

The earliest occupation at the site was characterized by the NBPW and soakage pits laid as shafts into the earth without the use of terracotta rings.[85] The next period, dated on the basis of available evidence to Cir 5th cen. BC.

30. Broach (Gujrat):

The occupation could be mainly divided into three periods on the basis of the present data.

Period-I about 5 to 10ft thick, yielded Black-and-Red Ware in good bulk and towards the upper level occurred the NBPW along with many plain wares. The first inhabitants of the town appear to have raised a mud rampart with the deep ditch on the outer side. While no structural remains were exposed, ring wells[86] in a cluster of five were found in one of the cuttings on the inner fringe of the rampart, with the plain types of pottery associated with the NBPW, from foundation pits of the wells. Other associated antiquities are a dozen bone arrow heads, pottery with molded and stamped designs, gamesmen etc. The beginning of this period may be datable to the 3rd Cen. BC.

31. Avra, Dist. Mandasor (Madhya Pradesh):

At Avra the excavation was conducted in mound-3, where Period-I was represented by Red Ware with painting in black, which is Chalcolithic in nature. Period-II was characterized by black burnished and painted Black-and-Red Wares. On the top there are NBPW.

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85 *Ibid*, p.20.

86 *IAR*, 1959-60, p.19.

Period-III had two ring wells[87] standing side by side, one with seven and the other with eighteen rings. The top of the lower one was joined with pottery pipes, eight in numbers, ending in a bend to discharge sulla ge-water. Near the end was a large jar containing fine loose ashy soil and several small broken pots, nine small bowls, a fragmentary quern, a pestle and a few bones?

The remains of a residential house, destroyed by fire, were brought to light. The walls were of reed and bamboo and were plastered with mud which had the impression of thin wooden planks. The objects of the period included spear heads, nails, looped hooks, a sickle, two copper coins-one of them punch-marked and the other Satavahana and a burnt ivory sealing with the legend *Jidhavasa* in characters of the 3rd Cen. BC.

32. Chandraketugarh, Dist. 24-Pargana (West Bengal):

Period-I-is dated to Mauryan period. Period-II- is charcterised by the NBPW, Black-and-Red Ware, beads of stones, ivory bangles etc. The building materials probably included tiles, wooden posts, etc. On the whole, the period may be ascribed to the early Mauryan period.

This period was also remarkable for the discovery of a pottery drain,[88] built of pipes each measuring 2ft. 3inch. in length and 6.5 inch. in diameter. Some portions of the drain seemed to have been repaired by means of the broken upper parts of pottery jars of different shapes and sizes. The fact that it did not continue for any great length would indicate that it did not serve the purpose of public sewerage.

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87 *Ibid*, p.24.

88 *Ibid*, p.51.

Just to the east of the end of the drain was an oblong area enclosed by vertical wooden planks supported by logs of wood with incised grooves for binding with cord. A reservoir, its sides of plank reinforced by logs of wood, was thus formed, probably the drain discharged itself into it. About 2 ft. 6 inch. to the south of the structure was a long rows of wooden posts thickly joined with each other. The construction was probably meant as a protective measure against soil erosion, the soil at this level being extremely sandy.

33. Exploration at Allahbad (Uttar Pradesh):

The mound at the Draupadighat yielded evidences of extensive habitation. In a 15-mts. high section cut by the Ganga were noticed several terracotta ring wells[89] and a few burnt brick walls. The pottery included specimen of the NBPW and the Red Ware usually associated with it. A few potsherds pointed to a date prior to that of the NBPW.

34. Exploration in Dist. Tanjuvur (Tamil Nadu):

An early historical habitation site yielding the Megalithic Black-and-Red Ware and other associated wares, terracotta ring wells[90] and medieval crude Red Ware and dilapidated burnt brick structure was discovered at Nandanmedu, 8km. from Kumbakonam on the bank of Tirumalairajan. The river bed and the sections revealed a large number of urn burials without Megalithic appendage.

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89 *IAR*, 1960-61, p.33.

90 *IAR*, 1961-62, p.27.

35. Exploration in Districts Allahbad, Azamgarh, Faizabad, Ghazipur and Varanasi (Uttar Pradesh):

Prof. Sharma examined the following sites[91] in the districts of Azamgarh, Ghazipur and Varanasi and collected from each sherds of the NBPW besides noticing ring wells etc. Bankatha in district Azamgarh, Bhitari, the site of the famous inscription of Skandhagupta in the district Ghazipur and Tikari in the vicinity of the Varanasi University.

Shri T.N.Roy and others of Banaras Hindu University explored the site of Prahladpur in Tahsil Chandauli of district Varanasi. At Prahladpur, on the bank of river Ganga, the NBPW and the associated grey, Black-and-Red, Black-slipped and Red Wares were found. Other finds included beads, terracotta objects and bangles of shell, glass and terracotta. Terracotta ring wells were also noticed along the bank of the river.

36. Sohagaura, Dist.Gorakhpur (Uttar Pradesh):

Period-I Black-and-Red Ware; Period-II- appearance of NBPW; Period-III was distinguished by the disuse of the NBPW. The associated pottery was represented by the lid with a central knob or flanged waist and shallow bowl with splayed-out rim and vase with stamped symbols like *tri-ratna*, characteristics of Hastinapura-IV. Ring wells[92] excavated on the western slope of the mound belonged to the beginning of this period. Besides, two terracotta figurines, one with a Sunga head-dress and the other with foreign features, beads and coins were also found.

Period-IV is of medieval period.

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91 *Ibid*, p.52.

92 *Ibid*, p.55.

37. Tilaura Kot, Dist. Taulihawa (Nepal):

The total thickness of the deposit from the top of the natural soil right up to the highest point of the present surface was 3.80mts. Period-I has two phases. Phase-A, laying over the natural soil and below a floor of brick grits and small brick-bats, consisted of three layers and was coeval with the advent of the NBPW. Belonging to this phase were three ring wells, one of which was exposed down to its bottom.[93] As its bottom course lay much higher than the water table, it is evident that it did not serve as a well in the real sense of the term. Of the remaining two, one was exposed down to its seventh courses (without reaching the bottom), while the other was traced to its twenty-sixth ring reaching the water level.

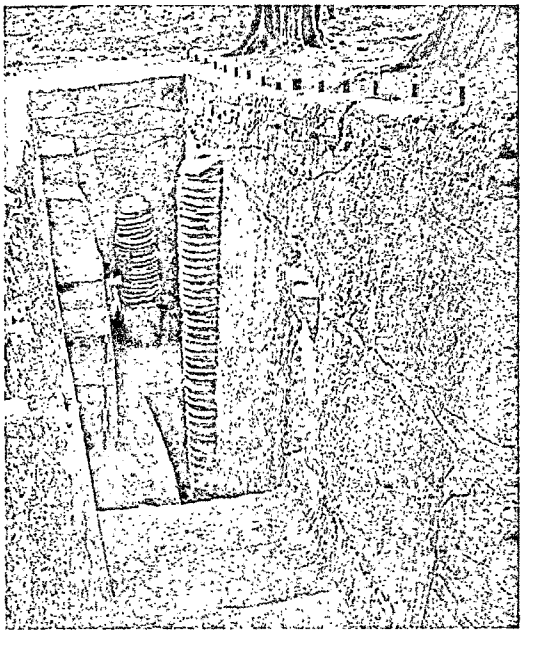


Plate-5 : Ring wells at Tilaura Kot. Courtesy IAR, 1961-62

Phase-B- was represented by the floor referred to above and two overlying layers, ending in a conflagration. Two brick structures and a ring well with fifty three extant rings belonged to this phase. During the phase the NBPW was in full currency. In both the phases, Red, Black-slipped and grey wares known to be associated with the NBPW elsewhere in the Ganga basin were fully represented. Both the phases yielded antiquities like beads, terracotta bangles, iron, copper, stone and bone objects.

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93 *Ibid*, pp.73-74.

38. Atranjikhera, Dist.Etah (Uttar Pradesh):

The excavation revealed six periods of occupation of which the upper four belonged to the historical and medieval periods.

Period-III (Cir.600-200BC) - was distinguished by the use of NBPW and other associated fabrics. The Black Slipped Ware and fine Grey Wares of the preceding period persisted for sometime, thus indicating an un-broken succession with an overlap of the two traditions. The other finds of Period-III were typical of this horizon except for a few pottery types, usually ascribed to Sunga period. Among the structures, mention may be made of a ring well,[94] a silo of mud bricks and mud-brick wall superimposed over another wall of baked bricks.

39. Eran, Dist.Sagar (Madhya Pradesh):

Period-I is Chalcolithic, and Period-IIA- was marked by the introduction of iron and the occurrence of the plain Black-and-Red Wares.

Period-IIB- was marked by the gradual disappearance of the Black-and-Red ware of the preceding sub-period and the innovation of the Red Ware. A few sherds with stamped designs were also found. Punch marked coins, terracotta animal and other figurines, copper and iron objects and beads of different materials continued. A floor made of rammed burnt brick-bats associated with two ring wells belonged to this period.[95] Period-III- associated with Red-polished Ware.

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94 *IAR*, 1962-63, p.34.

95 *IAR*, 1963-64, p.16.

40. Payampalli, Dist. North Arcot (Tamil Nadu):

A pit (1X1.5mts.) cut into the bed-rock, yielded the Megalithic Black-and-Red Ware in considerable quantities. From the contents, the pit appears to have been used for storage purpose.[96]

41. Chirand, Dist. Saran (Bihar):

The cultural sequence is being present of the Chalcolithic occupation in the lowest level of each trench. Period-IA- the associated ceramics did not show any new element except that the painted pottery was absent at the lowest level. Period-IB- has no modification. Period-II- witnessed the emergence of the NBPW.

Period-III- showed five phases of structural remains. Further clearance revealed a large structure of a residential type. In one of the blocks two small inter-connected rooms were found with a drain running through their floors into a square cistern outside the main building. These rooms could possibly have served either as bath rooms or as privies.[97]

42. Exploration in Dist. Monghyr, (Bihar):

The area locally known as Reha, late Stone Age tools on crystal quartz were found on the reddish gravel deposits. In the same area, six or seven pieces of mace-heads and a celt, made on phyllite rock were also found. No pottery was noticed. This appears to be a Neolithic site. A terracotta ring well[98] was also noticed at this site, although its precise chronological position still remains to be determined.

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96 *IAR*, 1964-65, p.22.

97 *Ibid*, p.22.

98 *IAR*,1965-66, p.7.

43. Kausan and Paithan, Dist. Aurangabad (Maharastra):

At Kausan, it was found that most of the upper deposits after having been washed away, had redeposited as small rolling mound near the bed of the river. The top most layer presented fairly reasonable evidence of a culture from the Satavahana times (Cir. 200BC to 100AD). The finds consisted of a structure of which only one brick course was available. The same stratum contains five ring wells or soak-pits, lined with pottery rings placed one above the other.[99] Other finds included copper coins with elephants, and Ujjain symbols, glass bead, terracotta bullae in imitation of Roman coins.

44. Sugh, Dist.Ambala (Punjab):

It revealed a succession of two cultural periods; Period-I being further sub-divided into two sub-periods. Sub-period-IA (Cir.600-500BC)- Occurrence of PGW. Furthermore, from the very start of the occupation, it was associated with NBPW. Sub-period-IB (Cir.500-100BC) - was distinguished by the absence of the PGW. Remains of brick-built houses, terracotta drain pipes and soak-wells indicated the urban elements of the settlements.[100] Associated finds included, terracotta figurines, iron and copper objects, bone or ivory points, beads of semi-precious stones, punch-marked and Indo-Greek coins in silver and inscribed and un-inscribed cast coins.

45. Masaon, Dist. Ghazipur (Uttar Pradesh):

Period-II is characterized by typical Sunga terracotta figurines. The NBPW continued to exist in dull and degraded forms along with the Black-Slipped course Grey and Red wares. Among important finds

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99 *Ibid*, p.28.

100 *Ibid*, p.36.

mention may be made of copper punch-marked coins, a cone shaped pendant, copper bangles, etc. The structural activities of this period were represented by two different thick floors of rammed clay with a soling of brick-bats and two ring wells.[101]

46. Ter, Dist. Osmanabad (Maharastra):

The excavation revealed[102] three main periods of occupation. Period-I- showed that the earliest settlement on the site belonged perhaps to the Mauryan period (Cir.300-100BC). Period-II- with a number of sub-periods was the most flourishing period, assigned to Cir.100BC to 100AD. Period-III- belonged to the late Satavahana period (50-200AD).

Ter, identical with ancient Tagara, developed commercial contacts with the western world only after about 50 AD, during the rule of Sri Satakarni. Remains of a large house were uncovered, portion of votive tanks, coins, beads of semi precious stones and glass.

As a precautionary measure against floods, the walls of the houses were erected on strong pebble foundations. Brick-lined soak-pits were in vogue in the late Satavahana period. The earlier soak-pits were invariably built of terracotta rings. A unique feature in the latter, ascribed to the Mauryan period, was the wooden frame in which the rings were fitted for stability.

47. Paunar, Dist.Wardha (Maharastra):

It has four fold cultural periods.[103] Period-I is marked by thin Black-and-Red Ware. Period-IIA is characterized by the Introduction of

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101 *Ibid*, p.50.

102 *IAR*, 1966-67, pp.25-26.

103 *Ibid*, p.27.

Iron. Period-IIB is a period of transition by the overlap between the Red Polished ware and the Black-and-Red Ware.

Period-III is belongs to late Satavahana (period of prosperity). The ceramic evidence comprised the Black-and-Red Ware, the Red-Polished Wareand the am*phorae.* Late Satavahana and Visnukundin coins are also found in this period. The structures associated with this period included brick construction with well made foundation, ring wells for soakage purposes and floorings made of rammed clay. The houses had tiled roofs.

48. Sarai-Mohana, Dist.Varanasi (Uttar Pradesh):

Period-I revealed three sub-periods-IA, IB and IC. Sub-period-IC was marked by the emergence of the course Grey Ware. The Red Ware industry too revealed some new types which were absent from the preceding levels. Black-and-Red Ware did not occur in this deposit. Structural activity was represented by a terracotta ring well,[104] partially excavated with three rings intact.

49. Bhokardon, Dist.Aurangabad (Maharastra):

The total habitational deposit was of five structural phases, all belonging to Satavahana period. Large scale evidence of brick and clay structures was available. These could be divided into five phases. The average house seems to have been equipped with a verandah, a sitting room and a kitchen, attached to which was a soakage well, built either of rings or of bricks (normal or of wedge-shape). The houses had no planned layout and a group of five houses was found to have been separated by irregular alleys. The houses had a rubble foundation, roof

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[104] *IAR*,1967-68, pp. 46-47.

held in position by wooden posts and covered with typical Satavahana tiles and floors of rammed clay. The kitchen was equipped with clay ovens with open arms and a series of storage jars[105] embedded on the floor.

50. Golkunda, Dist. Hyderabad (Andhra Pradesh):

One house complex was exposed, which is enclosed by wells running north-south on the east and west. The complex had a central hall with a courtyard and two rooms on either side. The rooms were internally connected by small doorways. At the rear end, on the south-eastern corner of the complex were unearthed a small kitchen, bathroom and latrine, which were connected with a drain partly covered by stone slabs. The drain, in turn, was connected with a soak-pit.[106] At the centre of the complex two cistern prefacing the courtyard were laid bare. One of them seems to have been used as a fountain. A conduit pipe which fed the tank and being connected to another cistern near the well was also traced.

51. Champa, Dist. Bhagalpur (Bihar):

It revealed three periods of construction, ascribable mainly to the middle and late phase of the NBPW and post-Gupta period. The first period of construction is represented by a terracotta ring well of 70cm. diameter of two courses,[107] a brick well of 201 courses with 0.96m.in diameter, and a brick wall of 13 courses running north to south. Associated finds with this phase included the rim of a copper utensil, stone weights, iron daggers, etc.

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105 *IAR*,1972-73, p.20.

106 *IAR*,1974-75, pp.2-3.

107 *Ibid*, pp.8-9.

52. Champaner, Dist.Panch Mahal (Gujrat):

Excavation[108] was conducted with a view to understand the life pattern of the affluent section of the society in the 15th -16th Cen. AD. The excavation in the area, marked by compound walls, revealed the existence of residential blocks, gardens, tank, stable, water channels, etc. showing five structural phases.

Soak-pits: They are of two types-(i) Ring wells with four rings built near the southern garden, and (ii) jars of two sub-types-(a) a small cylindrical jar placed in the ground outside the house to collect water coming from the house, and (b) large inverted jar fixed in the ground and connected with water place.

Latrines: They are broad U-shaped small structures in a series with small platforms in between the rows to keep water jars. They are found invariably near the water drains. They are either built by the side of the house or in a corner of the garden.

53. Piprawa and Ganwaria, Dist.Basti (Uttar Pradesh)

In phase-IV burnt brick enclosures for keeping household goods were provided in certain rooms. A ring well[109] of phase-II, having a diameter of 85cm was observed on the north-western corner.

54. Pariar, Dist.Unnao (Uttar Pradesh):

In Periar, the lowest level is marked by the occurrences of OCP. The succeeding period was characterized by PGW. The early level of the next succeeding period showed continuation of pottery tradition of

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108 *Ibid*, pp14-15.

109 *Ibid*, pp.39-40.

the preceding period along with the NBPW. The occupational deposit was of 40 cm. thickness. It was further noticed that these early levels were conspicuous by the absence of miniature bowls. Important antiquities are terracotta figurines, wheels and others. Among the structural remains noteworthy is a terracotta ring well.[110] It had four rings intact. A few brick-kilns with the top portion missing were also noticed.

55. Hulas, Dist. Saharanpur (Uttar Pradesh):

Period-III represented by a 70cm. thick deposit, yielding NBPW, Grey, Black-Slipped and associated Red Wares, overlapped with the PGW culture. Of particular interest was a high double storage jar.[111] The diameter of the inner and outer storage jar was 1.0 and 1.15m.respectively. An important structure of this period was an elliptical hearth.

56. Dangwada, Dist.Ujjain (Madhya Pradesh):

Period-I-which could be divisible into sub-periods IA, and IB respectively by Ahar and Malwa Chalcolithic culture. Period-IIA- (Pre-Mauryan) Period-IIB (Mauryan)- is distinguished from the preceding period by the presence of Punch-marked coins, NBPW, iron and copper objects and ring wells etc.[112] Period-III (Sunga-Kusana), Period-IV (Kshatrapa-Gupta), Period-V (Paramara).

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[110] *IAR*,1978-79, pp.61-62.

[111] *Ibid*, pp.60-61.

[112] *IAR*,1979-80, pp.54-55.

57. Taradih, Dist.Gaya (Bihar):

The excavations revealed deposit of five cultural periods. Period-I- revealed an economy in which agriculture, hunting and fishing played an important role. The pottery is of Black-and-Red ware of Chalcolithic culture. Period-II- marked by NBPW. The pottery in general was made of fine-grained levigated clay and well fired. This period also yielded a few pieces of Black Ware having graffiti marks and revealed at least two ring wells, rings of one of which are missing.[113] A few iron implements like nails and a leaf-shaped were also discovered, apart from coins and a few copper bangles pieces along with some fragments of crucibles.

58. Nalanda, Dist.Nalanda (Bihar):

The excavation yielded the remains of a monastic complex consisting of an enclosure wall running east-west. The remains of a votive stupa including floor and ovens were also exposed with the above said wall. The most remarkable discovery was a ring well (1m. in diameter) exposed up to the depth of 5 mts. The rings were decorated with incised, floral, and geometrical designs.[114] A few stray NBPW sherds with golden and silvery colour were also found.

59. Bharat Mandir, Dist. Dehradun (Uttaranchal):

It has three occupational periods. Period-IA is marked by use of crude NBPW (2nd Cen. BC to 1st Cen.AD) Period-IB was marked by the structural evidence of the Sunga-Kusana Period. The structural remains are walls and floors. A complete house having rooms, Kitchen and a bathroom was also discovered. The remains of drains and soakage jars from this level typically resemble with the remains of historical sites of

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113 *IAR*,1980-81, pp. 10-11.

114 *IAR*,1982-83, p.25.

north India.[115] Period-II was occupied in 8th Cen.AD, after a gap of three centuries.

60. Manjhi, Dist.Saran (Bihar):

Period-I is marked by Black-and-Red, Black-Slipped and associated Wares Pd-II (NBPW) - Characterised by the introduction of NBPW and iron. It is possible to further sub-divide this NBPW period into three sub-periods, early, middle and late. In Red Ware, Ahichhatra type 10A and miniature bowl made their appearance in *Sub-Period IIB*. In Sub-Period *pd-IIC*, the dominant industry was coarse NBPW (fabric-E) but top graded NBPW (Fabric-A) also continued. The introduction of carinated *handi* and incurved bowls was noteworthy feature of this sub-period. The presence of baked brick structures and ring wells were duly noted in *Sub period IIC*.[116] Ascribable to the last stage of this sub-period and to the beginning of the next period was a massive clay fortification.

61. Hampi, Dist. Bellary (Karnataka)

Located within the citadel complex, these massive platforms with broad avenues leading towards kings Audience Hall and the throne platform might have accommodated security guards meant for the citadel complex. Excavation carried out in between the inner enclosure wall and the Southern side of these structures brought to light huge granite blocks in east-west direction and the displaced pillar bases. They probably formed a part of another huge platform. The plan and purpose of there platform was yet to be ascertained. About 20 mts. south of Structure-2, a high disturbed soak pit consisting of three terracotta rings were also exposed.[117]

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115 *Ibid*, p.96.

116 *IAR*, 1983-84, pp.15-16.

117 *Ibid*, pp.37-38.

The ceramic evidence was represented by typical medieval wares comprising both plain and decorated varieties of Red, Grey and Black Wares along with Chinese pottery.

62. Kambrmedu, Dist.Thanjavur (Tamil Nadu):

The result of the excavation revealed that the site was mainly occupied by the early Megalith people with some survivals of late Neolithic elements followed by the late Megalithic and early medieval phases.

The vestiges of the early medieval period were highly disturbed but traces of brick walls, pits and abundant pottery of dull Red Ware were encountered together with terracotta objects.

A soakage pit of medieval period[118] with three courses of rings kept one above the other was another noteworthy feature noticed in the excavation.

The antiquities found in this phase included large number of beads, plumb bob, ball, ear ornaments, hopscotches, cakes, bangle pieces and coins. Terracotta figurines such as a broken figure of Ganesh, headless female and a male torso were significant. A large number of tiles were also collected from the upper level.

63. Khalkatapatna, Dist. Puri.(Orissa)

The excavation revealed a single cultural site. The Chinese celadon Ware along with the egg-white glazed and glazed chocolate ware of Arabian origin was found with the indigenous pottery. The indigenous pottery is generally of dark grey colour.

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[118] *Ibid*, pp.78-79.

No structural remains were encountered in the excavated area. However, the remains of a brick jelly floor, oven and a hearth were exposed. Several ring-wells[119] were also noticed. In the habitation area perhaps on either side of a back lane, a group of four to five ring-wells were noticed, each is supposed to be connected with a house. It is difficult to suggest if they were used as draw-wells. On the contrary, their proximity to each other suggests that these were used as soakage pits. However, it has been observed that the use of the rings in the draw-wells is a living practice in undivided Puri and Cuttack districts of Orissa.

On the basis of the material evidence, the site was under occupation between circa 12th-14th Cen. AD.

64. Moner, Dist.Patna (Bihar)

Period I mainly represented by a 78 cm. thick Chalcolithic deposit. Period-II is represented by 2.92 m. thick deposit of the NBPW phase. The lower levels of this deposit have yielded fine variety of NBPW sherds with thin section in various shades such as silvery, golden, steel blue, violet, black, etc. The associated wares of NBPW include the Black Slipped, Grey, Black and Red and Red Wares. A terracotta ring well consisting of eight courses of rings with a diameter of 74 cm. was found to be associated with the upper layers.[120] The antiquities obtained from the NBPW deposits comprised iron objects, Terracotta sling balls, bone stylus, Terracotta and stone beads.

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119 *IAR*, 1984-85, p59.

120 *IAR*, 1985-86, pp.25-26.

65. Mangalkot, Dist-Bardhaman (West Bengal)

Period-I and Period-II are Chalcolithic and dated from 1500 BC to 700BC. Period-III (about 0.35 mts. in thickness) occurred without any stratigraphical break. On the basis of ceramic industry can it be dated between 700 BC and 400 BC.

Period-IV (about 0.35 mts. in thickness) followed Period-III without any break. The period on the basis of available ceramic evidence and antiquities may be dated from the 4th Cen. BC to the 1st Cen.BC.

Period-V, represented by 1 mt. thick occupational deposit, was distinguished by Sunga-Kusana pottery of the typical Grey Ware and Red ware mostly with wash and occasionally with slip. The occurrence of sherds of the Rouletted Ware signifies Mangalkot's association with Indo-Roman trade. Other noteworthy finds recovered from the excavation were cast copper coins and others. The period also revealed structural complex in brick, probably used for dwelling purpose. The complex showed large scale brick activity scattered all over the mound during this period. In one trench, a brick wall having ten courses of bricks was found running in east-west direction with a corner proceeding to the northern side of the wall. This residential complex showed a floor made of rammed mud mixed with nodules and then plastered with lime. On the centre of this floor was found embedded a huge storage jar. To the east of this ring well (dia.70 cm.) with fourteen segments of terracotta rings ware encountered.[121] The cavity between the side of the pit could be traced filled with silt in the section facing east. The noteworthy feature of the ring well is the circular platform around the well, providing the evidence of the working level. Another ring well with six courses of rings (not fully exposed) was

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[121] *Ibid*, pp. 97-98.

also encountered. An oven showing huge accumulation of ash was also traced. The period may be ascribable to the Kusana Period.

Period-IV represented by thick deposit, yielding Red-Polished Ware in thin fabric. On the basis of inscribed seals, the period may be dated between the third Cen. and 5th Cen. AD. Period-V is badly disturbed during medieval period.

66. Daulatabad, Dist-Aurangabad, (Maharastra.)

The toilets, with the provision of soak-pits[122] and other ancillary private apartments are found in the trenches, were the revelation of privacy and secludedness of a class Muslim, who projected boldly a bar on free movements of his inmates of woman folk with *purdah* system.

67. Adam, Dist. Nagpur, (Maharastra)

Period-I is Microlithic; Period-II Neolithic; Period-III belonging to the advent of iron. Period-IV is marked by the appearance of NBPW. The remains of public drainage system, running east-west parallel to the inner fringe of southern rampart were traced to a length of 20.50 mts.

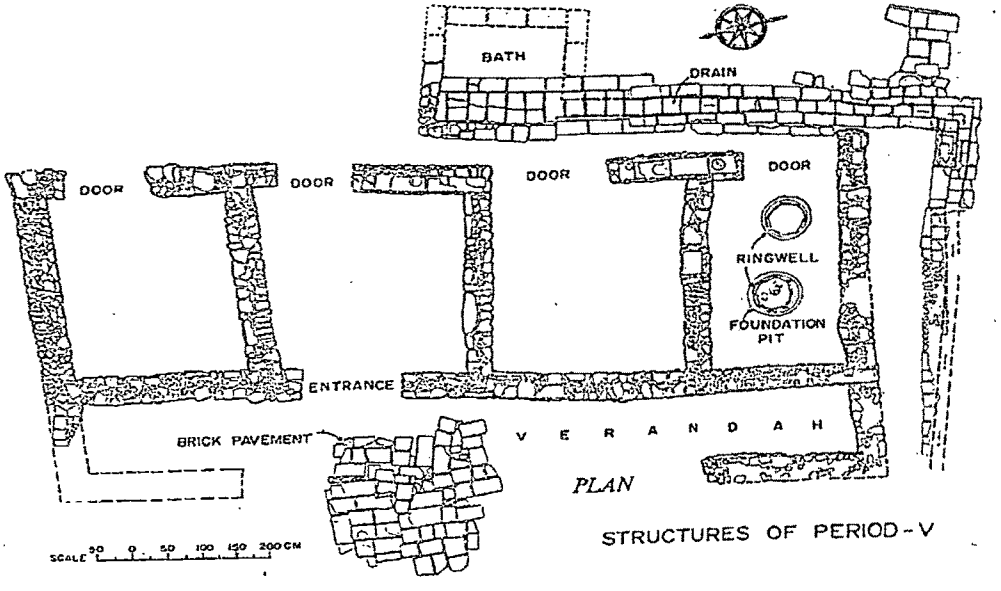


Fig.1 : Plan showing ring wells at Adam. Courtesy- IAR, 1990-91.

122 *IAR*, 1987-88, p.83.

At least three domestic drains running north-south were noticed joining the above drain at right angle. Built of burnt-brick in mud mortar, the base of these drains were brick paved. The upper course of the drain had Plano-convex type bricks of which the side profile of outer longer axis had vertical cutting. Another significant engineering device noticed was the formation of a step in the drain-bed; it has a vertical stone slab inserted at the edge of a fall. Such provision in a drain helps in increasing the velocity of discharge of refuse water in order to keep the upper level of the drain clean. Out of three domestic drains connected to the main drainage system, one in the middle was more intact than the rest. It originated from a brick paved bathing space attached to a terracotta ring well serving as water source to the house hold.[123]

Period-V is represented by the material remains of an affluent society. It marked in increase of structural activities. The Red Ware remained the predominant pottery, while Kaolin and Black Wares were in less use. A good number of decorated potteries have come to light, suggesting their affinity with the Satavahanas sites in Andhra Pradesh.

A large number of structures made of stone and bricks were also noticed. Most of the structures had single entrance and inter-connected rooms. The rectangular houses had series of two, three and four rooms in a juxtapose order. A four-roomed structure with a verandah in front had a passage across one of the rooms to reach in the courtyard, while the remaining three rooms had independent openings in the courtyard. The room on the southern flank had two ring wells which might have been used as 'privy' or refuse pit as the deposit inside was of pale green soil.

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[123] *IAR*, 1990-91, pp.45-50.

Two circular wells exposed during the excavation had upper ten to twelve courses in random rubble while the remaining lower courses right up to the base was of bricks. In one of the wells a huge stone slab with light grooves towards the longer axis was found in a dislodged position suggesting its use as foothold. Drain in burnt brick masonry was preferred to the rubble ones. Traces of private disposal of refuse water were noticed. At times the drains were noticed terminating either into the soak-pits or into streets. An example of square soakage tank (1.40 mts.) of thirty-two brick courses, brick drain running west to east, was very interesting. Terracotta ring wells used as soakage-pits have also been noticed inside the structure. A few ring wells also functioned as draw wells.

Among the antiquities reported were the types of coins or silver, copper and lead of punch-marked, cast and die-struck varieties, attributed to the Bhadras, Satavahanas and Roman rulers.

68. Mamallapuram, Dist. Chengalpattu (Tamil Nadu)

Excavation was conducted at the structural remains below the level of northern *Prakara* of the shore Temple. The well, cut into the sand bed, had two courses of stone rings.[124] In the top ring, an image of a goddess is depicted in a square niche. Interestingly the well yields portable water in spite of its location nearer to the sea.

69. Arikamedu, Pondichery (Tamil Nadu)

The excavation conducted in the Western part of Southern sector. There found some brick walls, dated shortly after the period of cir. 20 BC to 20 AD. This brick walls are more or less contemporary with the

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[124] *Ibid*, pp.62-63.

adjacent ring well[125]. At the lower levels, there were a sizable quantity of animal bones associated with sherds of coarse brownish-Grey Ware with white slip, Rouletteed Ware, and amphora pieces of cir 1st cen. BC.

70. Exploration at Unakoti, Dist-North Tripura (Tripura).

During the course of Exploration at Unakoti hill range, discovered stone images of Siva-Parvati, four-armed female deities, numerous fragmentary sculptures, *yoni-pitha*, door-jambs, besides a few architectural pieces and the remains of brick structures, ring-well etc.[126] Another interesting discovery is that of the mud rampart wall, habitational mound and a huge tank at Rangawooti.

71. Bhawar, Dist.Bhandara (Maharastra):

The entire deposit of 4.5mts. has revealed a continuous sequence of culture divided into four periods-I, II, III and IV respectively.

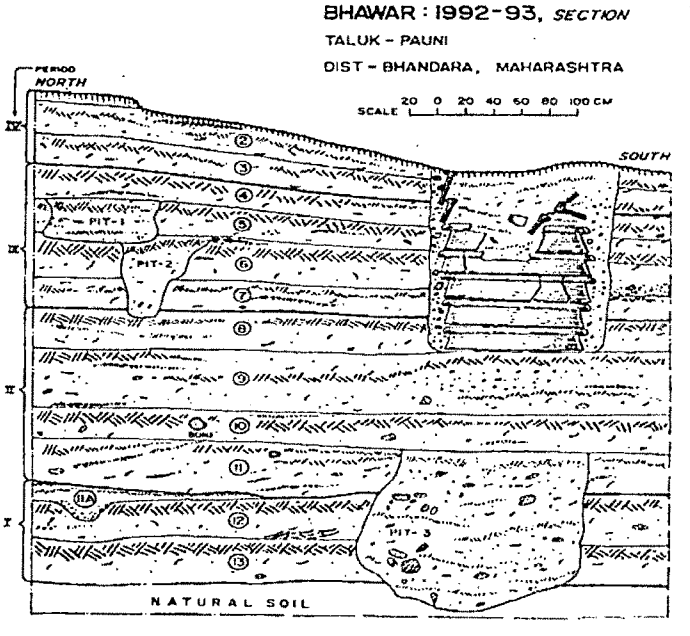


Fig.2 : Section showing ring well at Bhawar.
Courtesy-IAR 1992-93

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125 *IAR*-1991-92, pp.89-90.

126 *Ibid*, p.97.

Period-IV was of light to dark brownish semi-compact soil. It yielded a rich ceramic tradition which included Red-Slipped Ware, micacious Red Ware, Brown-slipped Ware and pale Red Ware. Important antiquities in this level include quern and mullers in stone, terracotta crucibles and areca nut-shaped beads and a few iron objects like knives, rods, nails and clamps.

Among the significant structural activities of this period were noticed a mud-floor with hearth and a terracotta ring well with eight rings measuring 1.05mts. diameter to a depth of 1.90mts.[127]

The excavation at Bhawar has given a tentative account of various phases of occupation right from pre-iron age to early historical period without any break, thereby covering a chronological time frame anywhere between 2nd millennium BC to the 1st half of 3rd Cen.AD.

72. Explorations in Dist. Villupuram Ramasamy Padatchiyar (Tamil Nadu):

In the course of preliminary off-shore exploration at Pumpuhar conducted by K.S.Sampath, S.Vasanthi of the Directorate of Archaeology (Govt. of Tamilnadu) and Gudigar and Sundaresh of National Institute of Oceanography, Goa, collected artifacts of semi-precious stones like- carnelian, agate, quartz and megalithic urn. Besides, a trial excavation at Chinnavanagiri and Periyavanagiri on the sea-shore revealed ring wells.[128]

73. Talkad, Dist.Mysore (Karnataka):

The excavation revealed Megalithic pottery besides, ivory objects, shell ornaments, terracotta figurines, beads of semi-precious stones,

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127 *IAR*, 1992-93, pp.55-62.

128 *Ibid*, p.89.

varieties of pottery of Satavahana period including Kaolin painted ware and iron objects, etc.

A huge ruined brick structure, identified as a *Jaina basadi* was exposed and was perhaps deserted during the Vijayanagara period.

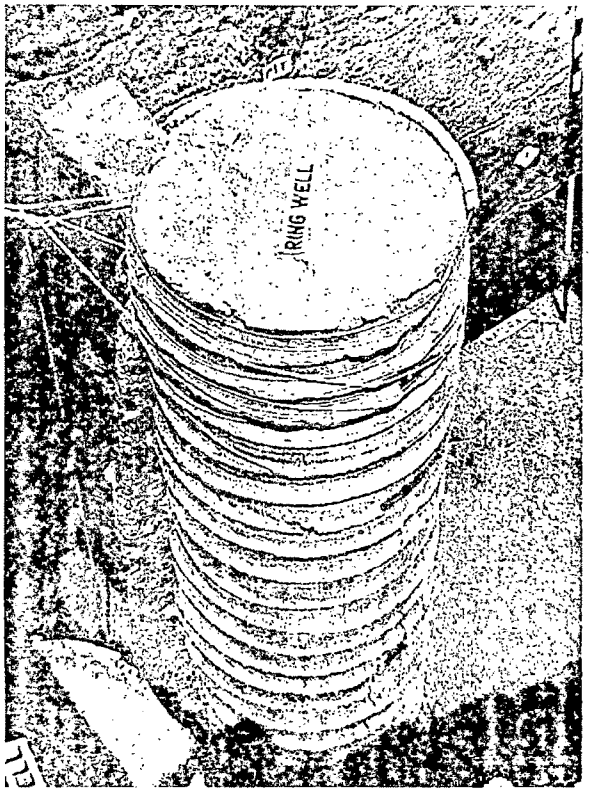


Plate-6 : Ring well at Talkad.
Courtesy-IAR, 1992-93

Besides the pottery, terracotta and semi-precious stone beads, *hukka* piece and a few remains of structures particularly the terracotta ring wells of Chola, Hoyasala and Vijayanagara periods were also found in large numbers.[129]

As mentioned above and a glance at the distribution of the ring wells, it is noticed that the characteristic features and occurrence of ring wells in India are having a vast area extending roughly from Sahabazgarhi[130] in the north to Arikamedu[131] in the south, and Brahmanabad[132] in the west to Mahasthanagarh[133] in the east. But the maximum occurrence of the ring wells is, however, in the Ganga basin.

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129 *Ibid*, pp.45-46.

130 *ARASI*,1921-22, pp65-66.

131 R.E.M. Wheeler, "Arikamedu: an Indo-Roman Trading station on the East Coast of India," *Ancient India*, no.2 ,NewDelhi,1946,pp.15-65; also J.M.Casal, *Fouilles de Virampatnam-Arikamedu*, Paris,1949,pp.32-35.

132 *ARASI*, 1903-04, p.135, also Henry Cousen, *The Antiquities of Sind*, vol.XLVI, Imperial Series, Calcutta, 1929, pp.51-52.

133 *ARASI*, 1928-29, pp.89, 92-93, *PL*-XXXVIII a & b.

SITES SHOWING RING WELLS AND THEIR FEATURES

Sl. No	Site	Location	Brief Description	Probable Date	Probable Use	Published Reference
1	Sonepur	Dist. Gaya, (Bihar)	In Period-II, houses were of wattle and daub. A noteworthy discovery of the period was that of a terracotta ring well having 37 rings.	NBPW culture	------	IAR:1970-71, pp5-6.
2.	Mandhal	Dist. Nagpur (Maharastra)	Exploration shows the remains of brick structures and soak-well	Historical period	Soakage purchase	IAR:1969-70, p.24.
3.	Vasavasamudram	Dist. Chinleput, (Tamil Nadu)	Two ring wells close to each other were exposed and a bricklined drain was attached to these wells.	Cir. 2nd cen. AD	Soak-pit	IAR:1969-70, p.33.
4.	Kaveripattinam	Dist.Tanjuvur (Tamil Nadu)	In the pre-temple phase, it is represented by two ring wells, sunk into the natural soil.	Prior to 10^{th} -12^{th} Cen. AD.	------	IAR:1969-70, p.35.
5.	Sonkh	Uttar Pradesh	A house complex, with a ring well to indicate the water supply for the community.	Pre-Kusana	Water supply	IAR:1969-70, pp39-40.
6.	Pallatharapallipuram	Dist. Alleyppey (Kerala)	Out of several ring wells, one of the ring well went down to a depth of 1.6m.	Associated with Megalith.	-----	IAR:1969-70, p.65.
7.	Pallavamedu	Dist.Kanchipuram, (Tamil Nadu)	In the lowest structural activities some fragmentary ring wells were noticed.	Pallava Period	-----	IAR-1953-54, p.12.
8.	Rupar	Dist. Ambala (Punjab)	In the third phase of construction, along with brick walls, ring wells were a feature of this period	Mauryan (NBPW)	------	IAR-1953-54, p.7.
9.	Prakash	Dist.West Khandesh (Maharastra)	Soakage jar and a ring well found to indicate drainage system	Prior to NBPW	Drainage System	IAR-1954-55, p.13.

10	Ahar	Dist.Udaipur (Rajasthan)	In the Black-and-Red Ware period, soakage wells lined with rings of baked clay were found.	Black-and-Red Ware period	------	IAR-1954-55, p.14.
11	Mathura	Uttar Pradesh	In the 2nd period (after 6th Cen. BC) there emerged three ring wells. - There are also well laid out walls, drains and ring wells.	2nd Cen. BC.	Drainage purpose	IAR-1954-55, p.15.
12	Rajgir	Dist. Patna (Bihar)	Remains of residential building along with ring well and a circular masonry well.	Early post-NBP	------	IAR-1954-55,p.16.
13	Tamluk	Dist. Midnapur (West Bengal)	A brick built stepped tank along with ring well and soak-pit were found.	C 1st-2nd CAD.	Soak pit	IAR-1954-55,p.19.
14	Kasital	Dist. Kurukshetra (Haryana)	The ring well is possibly used as barn.	-----	Storage purpose	IAR-1954-55,p.19.
15	Besnagar	Dist.Vidisa (Madhya Pradesh)	In period-I, associated with NBPW, ring wells, stone drains and brick with semi-circular holes were found.	Pre-Mauryan	------	IAR-1975-76,p. 3.
16	Kanchipuram	Tamil Nadu	The structural remains consist of rings in uppermost level and its rings reaching down to the natural soil.	Post-Pallava	------	IAR-1975-76, p.39.
17	Batesvar	Dist. Agra (Uttar Pradesh)	The structural activities of period-III represented by four successive mud-rammed floors, laid on brick-jelley foundation, a well of baked bricks built over a foundation of rammed earth, and two ring wells.	6th Cen.AD.	-------	IAR-1975-76, p.41.

18	Ayodhya	Dist. Faizabad (Uttar Pradesh)	In the post-rampart phase, terracotta ring wells were noticed.	Cir. 3rd Cen. BC to 1st Cen. AD.	------	IAR-1976-77, pp.54-55
19	Tumain	Dist.Guna (Madhya Pradesh)	In period-II, houses are made of baked bricks and rammed floor of brick-bats, pot-sherds and there were two ring wells.	Cir. 2nd Cen. BC to 1st Cen. AD.	------	IAR-1971-72,p.28.
20	Koldihawa	Dist.Allahbad (Uttar Pradesh)	In layer-2 found structural remains consisting of a floor made of rammed earth and burnt clods of clay enclosed by post holes. - Many refuse pits, going to varying depth of 29 to 110 cm. were noticed	Chalcolithic	------	IAR-1971-72, p.44.
21	Peddachepalli	Dist. Cuddapah (Andhra Pradesh)	Along with Black-and-Red Ware ring well was noticed.	Black-and-Red Ware period	------	IAR-1977-78,p.76.
22	Lothal	Dist. Ahmadabad (Gujarat)	To dispose of sullage water, soakage jars were made use of.	-----	Soakage purpose	IAR-1958-59, pp.13-14.
23	Sravasti	Dist. Bahraich (Uttar Pradesh)	In period-II, inside the rampart three terracotta soakage ring wells were noticed.	3rd Cen. BC. to 1st Cen. BC.	-------	IAR-1958-59, p.50
24	Alamgirpur	Dist.Meerut (Uttar Pradesh)	No structures but kiln-brunt bricks, mud bricks of uncertain dimention along with an un-lined soakage well are found	Late PGW & NBPW	------	IAR-1958-59, p.54
25	Nevasa	Dist-Ahmad Nagar (Maharashtra)	In period V, the soakage pit of terracotta rings or wedge shaped bricks were noticed. * some of them yielded burnt grains of bean, wheat etc.	Indo-Roman period	Storage bin	IAR-1955-56, P.11

26	Nagda	Dist-Ujjain, (Madhya Pradesh)	In period III, along with mud brick structure and NBP ware, storage jar is noticed	NBPW	Storage purpose	IAR-1955-56, P.14
27	Ujjain	(Madhya Pradesh)	In period I, the structural activities were of burnt bricks as well as roughly dressed stone ring wells were also present.	NBPW	------	IAR-1955-56, P.19
28	Kausambi	Dist. Allhabad, (Uttar Pradesh)	In the earliest occupation, the soak-pits laid as shafts into the earth without the use of terracotta rings.	NBPW	------	IAR-1955-56, P.20
29	Sonepur	Dist. Gaya (Bihar)	No brick structures were met with, but there were a floor plastered with lime and two terracotta ring-wells which are used for soakage of refuge-water	Late NBPW	Sokage pit	IAR-1956-57, P-19
30	Chnadraketugarh	(West Bengal)	In period II, alongwith NBP Ware, a drain of pottery pipes fitted in to each other were found.	Mauryan to Sunga	------	IAR-1956-57, P.30
31	Rajghat	Dist. Varansi (Uttar Pradesh)	In period II, a long drain, a terracotta ring well and the remains of a few wells were found.	2nd Cen. BC to 1st Cen. AD	------	IAR-1957-58, P.50
32	Broach	Gujarat	While no structural remains were exposed, ring wells in a cluster of five were found in one of the cuttings on the inner fringe of the rampart.	NBPW period	------	IAR-1959-60, P.19
33	Awra	Dist. Mandasor (Madhya Pradesh)	In period III, had two ring wells standing side by side, one with seven and the other with eighteen rings.	3rd Cen. BC	------	IAR-1959-60, P.25

34	Draupadighat	Allahabad (Uttar Pradesh)	In the exploration in this area a 15m. high section cut by the Ganga river, were noticed several terracotta ring wells.	NBPW period	------	IAR-1960-61, P.33
35	Tanjuvur	Tamil Nadu	Terracotta ring wells are found associated with Megalithic Black and Red Ware.	Megalithic	-------	IAR-1961-62, P.27
36	Sahagaura	Dist-Gorakhpur (Uttar Pradesh)	In period III, ring wells excavated on the western slope of the mound along with a structure standing to a height of ten brick courses.	Late NBPW	------	IAR-1961-62, P.
37	Tilaurakot	Dist-Taulihawa (Nepal)	In pre-defence age, Phase-A, were three ring wells, one of which its bottom courses lay much higher than the water table. In Phase B, it was represented by floor, two brick structures and a ring well with fifty three extant rings.	NBPW	-------	IAR-1961-62, PP73-74,
38	Atranjikhera	Dist. Ettah, (Uttar Pradesh)	In period III along with Sunga pottery, the structure of mud bricks and mud brick walls with a ring well there is also impressive burnt brick floor.	Cir. 600 BC to 200 BC.	-------	IAR-1962-63, p.34.
39	Eran	Dist.Sagar (Madhya Pradesh)	In the period-IIIB, emergence of Red Ware, Punch marked coins and structural activities of a floor made of rammed burnt brick-bats associated with two ring wells	Sunga period	------	IAR-1963-64, p.16.
40	Exploration at Reha	Dist. Monghyr (Bihar)	Ring wells are found.	------	------	IAR-1965-66, p.7.

41	Tripuri	Dist. Jabalpur (Madhya Pradesh)	In period-II, with improved building activities, houses were covered with terracotta tiles. Houses were also provided with sanitary conveniences like ring wells and soak-pits.	Post-NBPW	------	IAR-1965-66, p.22.
42	Kausan and Paithan	Dist. Aurangabad (Maharastra)	The structures of which one brick course was available. And also it contained five ring wells or soak-pits, lined with pottery rings placed one above the other.	Cir. 200BC to 100AD.	------	IAR-1965-66, p.36.
43	Sugh	Dist. Ambala (Punjab)	In sub-period-IB, it was absence of the PGW. Remaining of brick built houses, terracotta drain pipes and soak-wells indicated the urban element of the settlement.	Cir. 500 to 1000BC	------	IAR1965-66,p36.
44	Masaon	Dist. Ghazipur (U.P)	In period-II, the settlement activities was represented by two different thick floors of rammed clay with a soling of brick-bats and two ring wells.	Sunga period	------	IAR-1965-66, p.50
45	Ter	Dist. Osmanabad (Maharastra)	In the structural activities, the walls of the houses were erected on strong pebble foundations. -Brick lined soak-pits were in vogue. The earlier soak-pits were invariably built of terracotta rings. *A unique feature was the wooden frame in which the rings were fitted for stability	Mauryan period	------	IAR-1966-67, pp.25-26.

46	Paunar	Dist. Wardha (Maharastra)	The structure associated with Period-III included brick constructions with well made foundations. Ring wells for soakage purposes and flooring made of rammed clay. The houses had tile roof	Late Satavahana	------	IAR-1966-67, p.27.
47	Sorai-Mohana	Dist. Varanasi (Uttar Pradesh)	Period-IC having structural activity of a terracotta ring well, partly excavated with three rings intact.	Historical	-----	IAR-1967-68, p.49.
48	Bhokardon	Dist. Aurangabad (Maharastra)	Brick and clay structures of room and kitchen were noticed. These are attached to soakage-well, built either of rings or of bricks(normal or of wedge-shaped)	Satavahana	Water supply	IAR-1972-73, p.20.
49	Tamluk	Dist. Midnapur (West Bengal)	Terracotta ring wells were found. The diameter is of 80 cm. and the top level of which was found to have been disturbed.	Probably Medieval	-----	IAR-1973-74, p.33.
50	Champa	Dist. Bhagalpur (Bihar)	The first period of construction is represented by a terracotta ring well of 70 cm. diameter of two courses.	Middle phase of NBPW	------	IAR-1974-75, pp.8-9.
51	Rajgir	Dist. Nalanda (Bihar)	Period-II is characterized by the occurrence of a terracotta ring well and other rubble wall.	2^{nd} to 1^{st} Cen. BC.	------	IAR-1974-75, pp10-11.
52	Chamaner	Dist. Panch Mahal (Gujrat)	Soak-pits and latrines were found.	15^{th} -16^{th} Cen. AD.	------	IAR-1974-75, pp.14-15.
53	Piparwa and Ganwaria	Dist. Basti (Uttar Pradesh)	In phase-II, a ring well having a diameter of 85 cm. was observed.	------	-----	IAR-1974-75, pp.39-40.

54	Pariar	Dist. Unao (Uttar Pradesh)	Among the structural remains noteworthy is a terracotta ring well. It has four rings intact.	NBPW	------	IAR-1978-79, pp.61-62.
55	Hulas	Dist. Saharanpur (Uttar Pradesh)	Period-III is of particular interest by occurring a high double storage jar. The diameter of the inner and outer storage jar was 1.0 and 1.15m. respectively.	NBPW over lapped with PGW	------	IAR-1978-79, pp.60-61
56	Dhangwada	Dist. Ujjain (Madhya Pradesh)	In period-IIB, there are ring wells	Mauryan	-------	IAR-1979-80, pp.54-55.
57	Taradihi	Dist.Gaya (Bihar)	In period-II, the structural activity of at least two ring wells, rings of one of which are missing.	NBPW	------	IAR-1981-82, pp.10-11.
58	Nalanda	Dist. Nalanda (Bihar)	In the remarkable discovery was a ring well(1m. in diameter) exposed upto the depth of 5 meters. - The rings were decorated with incised, floral, and geometric designs.	NBPW	------	IAR-1982-83, p.25.
59	Bharat Mandir	Dist. Dehradun (Uttaranchal)	In period-IIB, the structural remains are walls and floors. A complete house having rooms, kitchen and bathroom along with drains and soakage jars were found.	Sunga-Kusana	-----	IAR-1982-83, p.96.
60	Manjhi	Dist. Saran (Bihar)	In period-II, the baked brick structures and ring wells were duly noted.	NBPW	-----	IAR-1983-84, pp.15-16.
61	Hampi	Dist. Bellary (Karnataka)	Within the citadel complex, along with other structures, soak-pits consisting of three terracotta rings was exposed.	Medieval	-----	IAR-1983-84, pp.37-38.

62	Kambarmedu	Dist. Tanjuvur (Tamil Nadu)	In the early medieval period, a soakage pit with three courses of rings kept one above the other was found.	Early Medieval	-----	Iar-1983-84, pp.78-79.
63	Khalkata Patana	Dist. Puri (Orissa)	In the single cultural site, no structural remains were encountered. However, a group of four to five ring wells were noticed, each is supposed to be connected with a house.	12^{th} -14^{th} Cen.AD.	May be draw wells.	IAR-1984-85, p.59.
64	Maner	Dist. Patna (Bihar)	Period-II, a terracotta ring well consisting of eight courses of rings with a diameter of 74cm. was found.	NBPW	----	IAR-1986-87, pp.25-26.
65	Mangalkot	Dist. Bardhaman (West Bengal)	In period-V, along with house complex and floor structures, a ring well (diameter-70cm.) with fourteen segments of terracotta rings were encountered. -The noteworthy feature of the ring well was the circular platform around the well, providing the evidence of the working level.	Kusana period	-----	IAR-1986-87, pp.97-98.
66	Daulatabad	Dist. Aurangabad (Maharastra)	The toilets with the provision of soak-pits and other ancillary private apartments were found.	Muslim Period	-------	IAR-1987-88, p.83.
67	Adam	Dist. Nagpur (Maharastra)	In period-IV, out of three domestic drains connected to the main drainage system, one is originated from a brick paved bathing space attached to a terracotta ring well	------	Water sources to house hold.	IAR-1990-91,pp.45-50.

	Adam	Dist. Nagpur (Maharastra)	-In period-V, the rooms on the southern flank had two ring wells which might have been used as 'privy' or refuse pit.	------	Refuse pits.	IAR-1990-91,pp.45-50.
68	Mamallapuram	Dist. Chinglpattu (Tamil Nadu)	The well cut into the sand bed had two courses of stone rings. In the top ring, an image of a goddess is depicted in a square slit-niche.	Pallava period.	Drinking water.	IAR-1990-91, pp. 62-63.
69	Arikamedu	Pondichery (Tamil Nadu)	Originally surrounded by brick floors.	------	Probably used for drawing water.	IAR-1991-92, pp.89-90.
70	Unakoti	Dist. North Tripura (Tripura)	Exploration at the site yielded various art objects and ring wells.	-----	------	IAR-1991-92, p.97.
71	Bhawar	Dist. Bhandara (Maharastra)	In period-IV, among the significant structural activity, there were mud floor with hearth and terracotta ring well with eight rings measuring 1.05mts. in diameter to a depth of 1.90mts.	Satavahana	----	IAR-1992-93, pp.55-62.
72	Pumpuhar	Tamil Nadu	In the Exploration at the site revealed terracotta ring wells	-----	-----	IAR-1992-93, p.89.
73	Talkad	Dist. Mysore (Karnataka)	Excavation revealed a few remains of structures particularly the terracotta ring wells	Chola, Hoyasala and Vijayanagar	-----	IAR-1992-93, pp45-46.
74	Brahmanabad	Sind (West Pakisthan)	Dug right into the sand below the natural soil. Most houses have their own ring wells. The diameter of the ring is 61cm.	Pre-Muslim)	Drinking water	Cousen, Sind, p.51; ARASI (1903-04) p.135.

75	Kumrahar	Patna (Bihar)	Wide brick pavement on three sides of the ring wells. The diameter of ring is 50.8cm.	Cir.150 BC to 100AD.	-----	Alteker and Mishra, Kumrahar, p.31.
76	Bhita	Allahabad (Uttar Pradesh)	A. Upper seven feet of wedge-shaped bricks. B. Capped with square well head.	A. Cir. 3rd Cen. BC. B. Cir.1st-2nd Cen. AD.	-----	AR ASI, 1911-12, pp.33, 39, 42-43.
77	Hastinapur	Meerut (Uttar pradsh)	Certain ring well made partly of wedge-shaped bricks on the upper portion. - Maximum 7m. is the depth without reaching the bottom of the ring well; cut into the natural soil.	Cir. 6th -3rd Cen. BC.	---	AI, Nos-10-11, pp.16-25.
78	Nevasa	Ahmednagar (Maharastra)	Ring wells dug into natural soil. Pairs of ring wells in a single pit, sides and space in between the ring wells was full of black clay.	Cir. 3rd Cen. 2nd Cen. BC.	---	Sankalia, Etal. Nevasa, p.59.
79	Bangarh	Dinajpur (West Bengal)	Surrounded by pavements with brick-on-edge. -Rope marks are found on the rings.	Cir.3rd-2nd Cen. BC. to Pala period.	Probably for Drawing water	Goswami,Bangarh, pp.8, 35.
80	Basarh	Muzaffarpur (Uttar Pradesh)	Ornate designs on the top of the ring wells.	Cir.3rd-2nd Cen. BC.	---	Deva and Mishra, Vaisali, p.11.
81	Rairh	Jaipur (Rajasthan)	Some ring wells penetrated into the natural soil. -cluster of ring wells surrounded by low walls; certain ring wells packed with upside down and bottom perforated; ring wells and storage jars placed side by side.	Cir.2nd Cen. BC. to 2nd Cen. AD.	---	Puri, Rairh, pp.14-17; Pls.III-a-e.

82	Sahabazgarhi	Peswar (West Pakisthan	Top of the ring measures 69 cms.	---	---	ARASI,1921-22,p.65.
83	Sisupalgarh	Khurda (Orissa)	Surrounded by a stone slab having central aperture of the same diameter the ring well; -Rope mark on the slab.	Cir.2nd Cen. BC to 1st Cen. AD.	May be for drawing water.	Lal, Sisupalgarh. A.I.-No.5, p.68.

ANTIQUITIES AND CHRONOLOGY OF RING WELL:

No doubt, use of water is as old as the emergence of human being. So also its use in a controlled way starts with human settlement in Neolithic (Prehistoric period) times, to which we have little evidence. In Protohistoric times, despite the fact that wells made of bricks and stones were used extensively in the riparian cities of the Harappan culture, but a true terracotta ring well appeared only in the early historic period.

As we noticed in this chapter there are evidences of soakage jars, soak-pits prior to early historic period. But ring well (no.2) of Hastinapur may claim a date as early as $5^{th}/4^{th}$ Cen.BC. From the evidence of Hastinapur, Bhita, Bhir mound, Rairh, Tripuri, Besnagar, Nasik one can easily say that this characteristic form of construction of wells spread over considerable parts of India during the Mauryan period. Their use continued in the subsequent periods also, and the tradition lingers on till today in some parts of the country, either as draw well or as soak-pits.

PARALLEL OUTSIDE INDIA:

As ring well appeared in the fifth-fourth cen.BC.in India, its emergence can not be explained unless it is found outside India. A

cursory look into the excavation reports on various sites from West-Asia shows that the practice of constructing ring wells, whatever may be the purpose, was a very ancient custom. Its origin remotely connected with religious rites and practices in south-Mesopotamia, going back as early as the 4th millennium BC.

At Ur[134], such construction have been called as *apsu* drains, means a mysterious deep and dark place reaching down to the waters of the under world. Such drains were constructed by digging a circular pit about a meter and a half in diameter and inside it were placed terracotta rings one on top of the other. Besides being of religious character, these drains were also used as seepage drains.[135]

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[134] Sir Leonard Wooley, *Ur Excavations*, Vol-IV (The early period), Philadelphia, 1956, pp.41-42.

[135] John Punnet Peters, *Nippur or Explorations and Advantures on the Euphrates*, Vol-II, New York and London, 1898, pp.235-36.

CHAPTER – III

THEORETICAL DISCUSSION ON RING WELL

THEORETICAL DISCUSSION ON RING WELLS:

With the march of time, human being tried to utilize all its available resources for his benefit in a modified and controlled way. A sense of healthcare, cleanliness and hygienic apparatus were emerged for development of human life span. Hence, the system of sanitation was a prime concern since the dawn of civilization. Drains, privy, soak-pits and other devices were built in different materials like stone, bricks pottery in different phases of culture for sanitation and procurement of water.

For a healthy productive life, a convenient supply of clean water and the sanitary disposal of wastes are essential. Unsafe water for human consumption can spread disease. Now-a-days, the most advance method of excreta collection and disposal were neither possible nor necessary to install such systems in ancient times. So also it was not easy to install septic tank with necessary plumbing. But the then pit-latrines are as effective as these modern methods in controlling diseases and are cheap to build and easy to maintain.

In the early phase of NBPW, while the drinking water might have been obtained from the nearby river or rivulet (as almost all the sites are situated on the bank of some or other river), individual houses had their own sanitary arrangements for the disposal of the sewage. Though the evidence from excavations is inadequate to have proper idea about the exact location, various usages and other details of the privies, soak-pits or draw wells, because of small scale vertical digging. But on account of such excavations of different sites in India and views propounded by some excavators, we can have some idea about the construction, use and other details of ring wells.

Hence, a few but important excavations reports having ring wells and views given by authors are analyzed with relation to associated finds in archaeological context.

RING WELLS AT NEVASA:

The excavation at Nevasa[1] revealed six fold cultural sequence and these are- Period-I- Early Palaeolithic (M. Pleistocene) Cir.1, 50,000; Period-II- Middle Palaeolithic (U.Pleistocene) Cir.25,000; Period -III- Chalcolithic Cir 1,500 BC-1,000BC; Period -IV- E. Historic Cir 1,50BC-50BC; Period -V- Late- early. Historic (Indo-Roman) Cir.50 BC-200AD; Period -VI- Medieval (Muslim) Cir. 400AD-1,700AD.

Period-V- witnessed the same feature as in Period -IV. The lime or hydraulic lime mortar floors, the embedding of storage jars in the floor, wooden posts supporting the roofs are all these remained the same in Period-V. The only new but very important feature of the habitation of this period was the extensive use of tiles for roofing, bricks for walls, elaborate foundation, bricks and ringed soakage pits and the association of burnt grains. The extensive brick structures were exposed at 8ft. below the surface and were sealed by layer-3.

The floor of this period consists of black clay, hay and lime. Though the bricks had not suffered in any way, extensive patches of burnt floors were also with the remains of these structures almost in all trenches. In the northern rooms, extensive patches of ash and burnt logs of wood were found. Associated with these were abundant remains of burnt grains like wheat, and pulses. Inside these rooms were found

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1 H.D.Sankalia, *From History to Pre-History at Nevasa* (1954-56), Poona, 1960, pp.53-63.

fragmentary storage jars and globular pots which might have been used for storing the grains.

The most interesting structures of this phase are the soak-pits. These were found in squares H and I. These, though contemporary, could be grouped into three types—

(I) Soak-pits built of bricks of normal shape,

(II) Soak-pits built of trapezium-shaped bricks,

(III) soak-pits built of terracotta rings.

These ringed soak-pits were found in a pair close to each other. The gaps between them are wider towards the bottom. The eastern soak-pits have eleven intact and one broken rings placed one above the other with the rim on top. On the rim of the lower ring rested the base of the upper ring. The western soak-pits have eleven rings. Though alike in technique, the following points of differences are noteworthy.

(a) The size of the rings of both these soak-pits was not uniform. Whereas the western soak-pits had ring of smaller diameter at the lower portions, the upper portions were fitted with rings of gradually wider diameters.

(b) In the case of the eastern soak-pit, the height of the every ring was not uniform. The upper rings had more height than the lower ones.

(c) The diameters of the rings of the western ring wells varied between 2ft. 9 inch. and 3ft. 3inch; the height of the rings of the eastern soak-pit varied between 1ft. 6 inch. and 1ft. 3inch.

(d) The rings of both the soak-pits were coated with a greenish moss at their lower portions due to constant contact with water.

(e) The sides and the space in between these two soak-pits were full of black clay.

(f) Both these yielded burnt grains, Red Polished Wares and a lot of rubbish.

Within the dimensions of the square I, it is not possible to ascertain the location of these ring wells in relation to the plan of the habitation.

The structural activities of this phase, besides having brick walls, and soak-pits, there are also post holes for wooden post to support the roof above. The brick wall revealed the post-holes regularly at a distance of two and a half feet. It is also likely that these acted more as support, in the walls rather than to roof. Several circular post-holes were sunk to the depth of nearly two feet. The diameter of these varied between four to six inches. However, a number of post-holes, scores of iron nails, and tiles were found associated with these structures. It is certain therefore, that the houses were roofed, with tiles fixed to the rafters below by means of such nails.

After discussing the above finds, it can be said that ring wells of this site were used for sanitary or privy purpose for various reasons, such as (i) the ring well are found very close to each other, (ii) The lower portions of some of the ring wells are coated with greenish moos due to constant contact of ground level water, and (iii) These ring wells contain a lot of rubbish.

RING WELLS AT BANGARH:

At Bangarh,[2] the excavations revealed five fold strata. Stratum-I is of Muslim period. In stratum-II- the structural activities are almost same throughout the site with slight local variations. Generally speaking, the building of the second stratum is found at the level of 1.5ft.to 4.5 ft below the datum. Trenches 5, 7, and 8 have supplied examples of structures belonging to the second stratum which form a study of the building and associated objects, may be ascribed to the late Hindu or the Pala period.

In trench-8, the pavements with brick-on-edge and laid flat have been discovered by the side of a well in the stratum-II. One such ring well (diameter 4ft.6 inch) of the Pala period with rope marks at the top surrounded by pavements with brick-on-edge and laid flat has been exposed. No other well has yet been discovered in this stratum. Probably the scarcity is due to the fact that the ordinary people used the water of river Punarbha flowing nearby. Moreover, some other wells, if there were any, may be revealed in course of further excavation.[3]

Stratum-III is of Gupta period/Late Gupta belongs to 4th Cen.AD, where no structural activities except a roughly circular brick built *Kunda* has been found. Stratum-IV is dated to Sunga Period (1st -2nd Cen. BC), where the structural activities are insignificant, but in Stratum-V, the only structure found is a ring well (dia. 2ft. 5 inch) in trench-5 at the depth of 2ft. from the datum. The excavation was carried down up to the virgin soil in this area near the ring well but nothing important came out. Probably this ring well marks the site of one of the earliest civilized

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2 K.G.Goswamy, *Excavations at Bangarh* (1938-41), University of Calcutta, 1948,pp.6-11

3 Ring wells according to some scholars, served as soak-pits, but the purpose of the Bangarh ring wells was apparently to supply water to the citizen.

settlements in Bangargh in Bengal. The peculiarity of this stratum is that all the specimens of Black Ware besides Red and Grey ones were found in this layer.

After discussing the above mentioned fact, it can be said that- (i) the structural activities associated with stratum-II (Pala Period) at Bangarh are basically made of brick-on-edge and laid flat. Moreover, these activities are concentrated around a ring well belongs to same period. (ii) In the ring well at Bangarh is used for drawing drinking water.

RING WELLS AT PRAHLADPUR:

The two ring wells at Prahaladpur[4] shows that they were dug into natural soil. They were exposed upto the depth of 1.75 cm. from available top surface with a clear foundation pit of about 12cm. made for placing terracotta rings. In ring well-1, only two rings were exposed, while in ring well-2 only ten rings are found intact. The upper rings of both these ring wells were already missing hence it was not possible to know their sealing layer and connect the same with any habitation. The two wells were situated at a distance of 1.52 mts. apart. Their upper diameter was 75cm and approximate width of each ring excluding the



Plate-1 : Ring wells at Prahaladpur, after Narain & Roy.

[4] A.K.Narain and T.N.Roy, "The excavations at Prahaladpur (Mar-Apr.1963)", *Monograph of the Dept. of A.I.H.C and Archaeology*, BHU,1968, p11.

grooves at either ends was 14 cms. Thus the lower groove of the upper terracotta ring was found fitted in the upper groove of the lower ring. Since both the ring wells were similar in nature, it is likely that they were constructed at the same time.

The excavations at Prahaladpur is especially important for providing a vital information that it is difficult to ascribe a date to a particular ring well in archaeological context, unless there has been found the upper parts or the then working level.

RING WELLS AT TRIPURI:

Soak-pits or ring wells B and C at Tripuri[5] were found at a depth of 6ft.7inch below the surface. These are separated from each other by a distance of 4ft. and are constituted of seventeen courses of pottery rings piled one above the other. The rings are made of rough hand made pottery about 2.5ft. in diameter with an average height of 8 inches of each ring. Their sides are slightly concave and the mouths splayed in such a way as to fit into the lower ends of the corresponding upper ring. The over-all height of these rings is 12.5 to 13 ft.

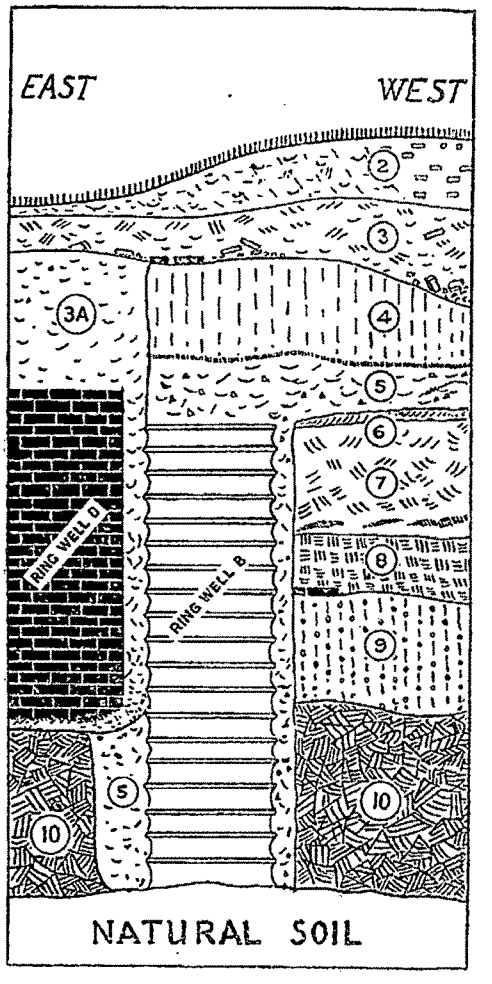


Fig-1 : Section showing ring well at Tripuri, after Dikshit.

5 M.G.Dikshit, *Excavations at Tripuri*, Sagaur University, Nagpur,1952, pp. 23-27.

For the construction of the soak-pits a large ditch, approximately 10ft. in diameter was dug to a depth of 14 ft. to reach the natural soil. There after the rings were then piled and fitted one above the other and the space in between the two was filled with rubble and compact earth. The top most ring of each soak-pit was perhaps fitted with a loose domical lid, because such one intact piece was recovered *in situ* in one of the ring well.

The soak-pits were connected with the corner of the room. Out of the two soak-pits, only one had its entire vertical pipe very well preserved. Both these ring wells are belong to stratum-III. It was so at least in Tripuri and from the cluster of these ring wells within a distance of few feet and belonging to different periods, it can be suggested that there area was reserved for such sanitary equipments.

The date of both the soak-pits is coeval with the other structures in stratum-III, assigned to about 3rd Cen.BC. Whereas another soak-pit of the subsequent period is dated to about 200AD.

A brief study of excavations at Tripuri gives important information that (i) the method of constructing a soak-pit. (ii) Interestingly, evidence of well-head in the form of loose domical lid is also found from this site. (iii) From the cluster of ring wells within a very little space, it is assumed that the ring wells are used for sanitary purpose.

RING WELLS AT BHIR MOUND:

At Bhir Mound[6] there disclosed four strata starting from the top designated as strata-I, II, III and IV. The foundation of the second stratum was found at an average depth of about 4 to 6 ft. below the surface. The third is at a depth of 9 or 10 ft. and the virgin soil was reached throughout the site at a depth of 16 to 20 ft.

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6 Sir John Marshall, *Taxila*, Vol-I, Cambridge, 1951, pp.88-95.

Period-I-200BC, Period -II- Late Mauryan (3rd Cen.BC-200BC), Period-III-Alexander Invasion (400BC-300BC), Period-IV-500BC earlier.

In Bhir Mound, the open street drains were constructed roughly of stone. They were meant, exclusively for rain water, not for sewage. For the disposal of sewage each house was furnished with one or more soak-wells. Similar soak-wells were also provided for the public convenience.

House refuse pits were disposed of by throwing it into the municipal pits or bins provided in the public streets or squares. Sewage on the other hand, was thrown down by the private soak-wells which were maintained in every house. As a rule there was one such soak-well in every courtyard and one for the privy, bathroom, wash house or kitchen.

These soak-wells were peculiar to the settlement in the Bhir mound, where they go back to the earliest times. But the only exception that these are not found at Taxila after the advent of the Bactrian Greeks[7]. These are of several kinds. The simplest and the earliest form is a circular shaft about 2ft.6inch. to 3ft in diameter and sunk to a depth of 15 to 25ft. This type is without any lining and was filled with rough pottery vessels (*Lotas, gharas*, and the like) turned upside down, between which sewage could percolate and soak into the earth. Soak-wells of this type were in use only during the earliest settlement on the Bhir mound. In the latter settlements the wells were lined with limestone and *kanjur* to a depth varying from 8 to 18 ft., or more, below which the shaft narrowed and was left un-lined. Their inner diameter varies from 2ft.2inch to 2ft. 10 inch at the top.

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7 In the Greek stratum in the Sirkap.

The second type of semi-*pakka*, semi-*kachha* well was sometimes filled with vessels, sometimes not. From one of them, 164 vessels were taken out-60 broken and 104 intact-comprising *gharas, lotas* and pots of various other forms.

The third type of soak-well[8], partly lined in the same way with stone masonry, is rectangular in plan instead of circular. This is only one specimen of this type has been unearthed. It may be inferred that the square form was not found as satisfactory as the round one.

The fourth type, instead of being stone lined, is constructed of earthen ware rings. Only four specimens of this particular type have been found. A good example which appears to be referable to the 3rd stratum, though it may be later. It is composed of fourteen well-baked rings, of which nine at the bottom are about 25 inch. in diameter by 6inch. in height, while the five at the top, representing perhaps a latter addition, are of the same height but only 21 inch. in diameter.

The fifth type is constructed of large earthen ware store-jars, set one above the other, with holes at their bottoms. It is noteworthy that these soak-wells frequently occurs in pairs in close juxtaposition one to the other. The explanation of this may be that when one well was full, it was closed in and a new one opened alongside. But it may be that they were intended to be used alternately, one being left to dry while the other was in use.

The frequent presence of large water-jars found *in situ* close by them suggests that many of them were located in bathrooms and

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[8] It measures 2ft.6inches by 3ft. and belongs to the latest settlements.

kitchens. Soak-wells constructed of a succession of earthen ware vessels have also been found in Mesopotamia.[9]

From the study of ring wells at Bhir mound it is found that –(i) a good example of development in the physical features of ring well is marked from the site. From un-lined pit in the first stage to jars set one above the other with bottom knocked off in the second stage and finally the terracotta rings is no doubt a line of development. (ii) From their mode of construction and associated finds, it is no doubt, the soak-pits of Bhir mound are used for sanitary purposes.

RING WELLS AT PAUNI:

In Period-III at Pauni,[10] the structural remains were either of ring wells or mud floors together with a *chulah*. Out of four ring wells, two were exposed completely, third was exposed up to thirty rings while fourth one in a better condition was exposed to an extant of five rings.

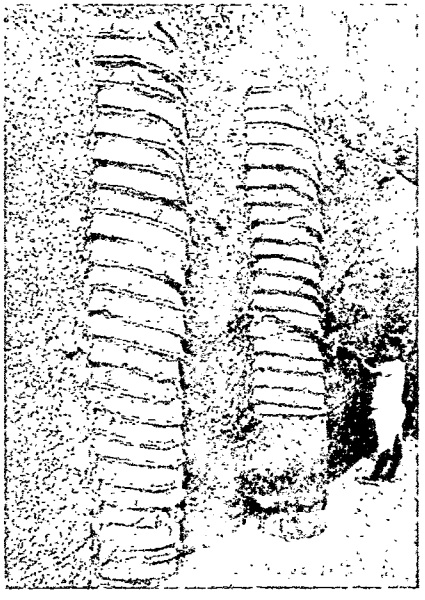


Plate-2 : Ring wells at Pauni after Nath

Ring wells-1 and 2 - These were noticed juxtaposed in the rampart. The two rings of identical diameter of 65cm, but had varying number of rings set one above the other in cylindrical pits. Ring well -1 had twenty rings, set sufficiently above the sub-soil water level while Ring well-2 had twenty-five rings, the base course rested slightly above the natural soil. The two can not be called draw wells as there was no sign in the cutting to

9 Sir John Marshall, *op. cit.*,(1951), P.95.

10 A.Nath, "Further excavations at Pauni", *MASI*-No.16, p.17.

indicate that at any point of time the sub-soil water level ever reached the lower courses of these ring wells. Some might consider these as water-closets for collecting rain water for domestic usage. It may not be out of place to note that the potable water was short in supply in this site. Therefore, a number of water reserves were devised to store water in the vicinity of the site, where as some wells were also dug for specific use.

Ring well-3 : The upper courses of this ring well were badly damaged due to later pit activity. After exposing 31-courses, further digging was stopped due to sub-soil water. The diameter of the ring well was 52cm.

Ring well-4 : Of all the ring wells, either of period-III or IV, it was a better preserved specimen and possessed rings of larger diameter (75cm.) than the others.

After study of above mentioned ring wells at Pauni, it can be said that (i) the two ring wells (1 and 2) can not be called as draw wells, as because at any point of time the sub-soil water level have never reached the lower courses of these ring wells. Hence, the excavator thinks these are to be used either as barn or water closets for collecting rain water for domestic purposes.

RING WELLS AT KAUNDINYAPURA:

Excavations at Kaundinyapura[11] exposed so many masonry (brick) wells and ring wells made of potteries. In one such masonry well the bricks are of wedge-shaped variety. Though it was excavated down

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[11] M.G.Dikshit, "Excavations at Kaundinyapura", *The Director of Archives and Archaeology*, Maharastra State, Bombay (Maharastra),1968, p.11.

to the natural soil, yet it was not opened completely to ascertain the contents of it. But it was used as rubbish pit.

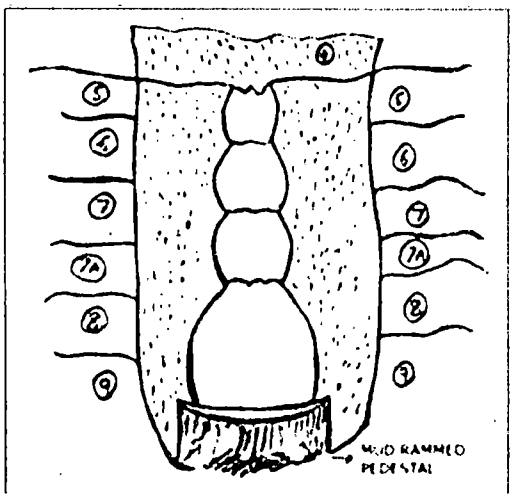


Fig-2 : Placing of pots one above another

These ring wells could be attributed to Period-IV, which is dated about 100-200AD (Satavahana Period). Some ring wells of Kaundinyapura were also reused for drawing water, as these soak-wells are invariably sunk deep enough to reach the natural soil.

However, Kaundinyapura yielded the remains of a soak-well constructed out of five extraordinarily large bottomless earthen jars placed one above the other. Layer-3 showed that this soak-well was sealed by it.

The soak-well was laid into the natural soil by cutting a vertical deep Pit of 7.5ft. in depth into the virgin soil. The jars are about 2m. in width and about 2.5m.in height. The lower most jar was some what larger than the rest of the three and had collapsed considerably in ancient times. The bottom of each of the jars was chopped off and they were placed one above another. After placing the jars the pit was pecked with material comprising of rammed pot-sherds and lime, with a sprinkling of brick-bats surrounding the whole area and the mouth of the upper most jar.

Period-I-Megalithic (layer12-21); Period -II Pre-Mauryan (layer-8-11); Period -III Mauryan (layer-6-7); Period -IV Satavahana (layer-5); Period-V-Late-Satavahana (layer-4); Period -VI Muslim (layer-2-3).

RING WELLS AT KARAD:

At Karad[12] there are some ring wells found in the exploration, which are shown on the plan, the ring wells are separated from each other by a considerable distance. Ring well-1 stands at the farthest end of the site towards the north. Ring Wells -2 and 3 are about 30 yards apart from each other, the distance between Ring well -1 and 2 being about 180 yards.

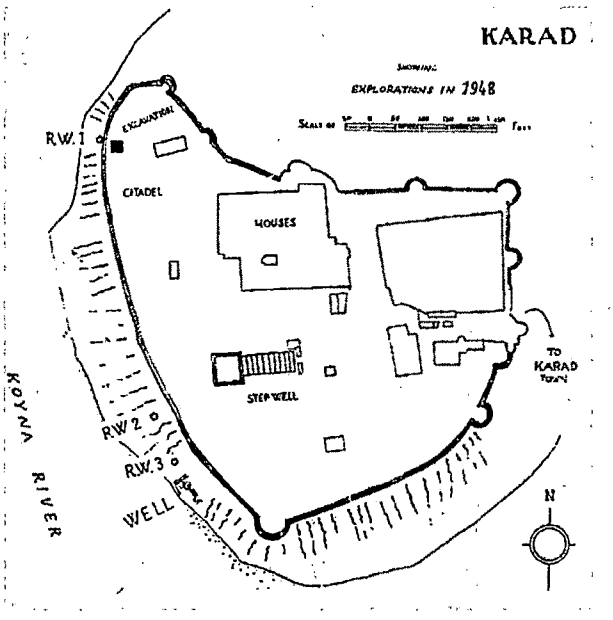


Fig-3 : Plan showing ring well at Karad. Courtesy – Bharat Itishas Samsodhaka Mandala

Ring well -1: is situated in the north-west corner of the site and has practically lost its entire shaft. Only the lower most portions of its base standing up to a height of 3ft. 10 inch. The original height of the ring well, however, must have been considerable as can be judged by a high cylindrical hallow left on the over hanging section on the western face of the mound.

Ring well-2 : This well stands on the central portion of the mound. It also had lost some portion of its superstructure. The diameter of this ring well is 2ft. 6inches. After clearing the accumulated river silt in the topmost layers, the ring wells is found to contain very dark red compact clay intermixed with ashes for a depth of about 14ft down to the bottom of circular shaft of the well. The shaft was constructed out of regular bricks, rectangular in shape and showed inferior workmanship in their

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12 *Exploration at Karad*, Bharata Itihasa Samsodhaka Mandala, Poona, 1949, pp.-86-92.

laying, particularly towards the bottom. The bricks were cemented together with mud-mortar and no special care seemed to have been bestowed in making the walls perpendicular.

The finds in this well included several tiles with two holes, terracotta beads, conch shell bangles, one glass ear-boss and one Satavahana coin.

Ring well-3 : This is situated at distance of nearly 92 ft. towards the south of Ring well-2 and its extant remains are approximately on the same level as the top most portions of the latter. It has a diameter of about 3ft. 10inch and a considerable portion of its superstructure is washed away. The contents of this well were mixed deposit of alluvial clay, sand and ash similar to those in Ring well-2, but it was particularly rich in discarded pottery and other antiquarian objects.

The pottery found in this well included several double-holed tiles, and six complete vessels. The other finds included several terracotta beads of the areca nut shape and one gold-gilt base of a copper vessel (dia.1.5inch) with numerous concentrically grooves at the base. Amongst the special type of pottery mention may be made here of a Roman tumbler. Numerous fragments of dishes with a black burnished slip were also found.

After thorough study, regarding the probable use of these ring wells, it can be said that the presence of ring wells, three of them at least within a very close proximity of each other, raises an important problem. As like other sites, the ring wells at Karad may be used for sanitary purposes.

However, after analyzing the finds and other associated materials alongwith the mode of construction, the wells in early historical India basically fall into two groups. These are –

Type-I: Masonry structures erected by using bricks and stones found from the important sites at Paithan[13] (Maharastra), Bhita (Uttar Pradesh)[14], Taxila (North-West frontier)[15], Kondapur (Andhra Pradesh)[16] and others.

Type-II: Wells built by laying closely fitted pottery rings over another. Well of type-I are a few in number in comparison to type-II variety. Wells of type-II seem to be most commonly noticed from several ancient sites in India (as mentioned in chapter-II) and a few important are given below.

1. Ahichhatra (Uttar Pradesh), 2. Arikamedu (Tamil Nadu), 3. Bangargh (West Bengal), 4. Basarh (Bihar), 5. Bhita (Uttar Pradesh), 6. Brahmanabad (Sindh, Pakisthan), 7. Kondapur, (Andhra Pradhesh), 8. Masson Dih (Uttar Pradesh), 9. Rairh (Rajasthan), 10. Sahet-Mahet (Uttar Pradesh), 11. Ujjain (Madhya Pradesh), 12. Mahasthangarh (West Bengal), 13. Paharpur (East Bengal).

At Ahichhatra[17], in Uttar Pradesh several ring wells of type-II have been unearthed in the excavations by the ASI in 1940-44. At Ariklamedu[18], on the east coast, excavations by the French Govt. brought to light eleven wells, constructed out of pottery rings. At

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13 *Annual Report*, Arch. Dept., Hyderabad, 1936-37(PL-XVIIIb)

14 *ARASI*, 1911-12, pp42-43.

15 *ARASI*, 1919-20, p.22, 1920-21,p.47.

16 *ABORI*, XXII, PL-XVII.

17 *IAR*, 1956-57,P.95.

18 *Ancient India*, No.2, pp29-32 and PLs-XIII and XV.

Bangargh[19], the Calcutta University excavations of 1938-41 have revealed the existence of two pottery ring wells. At Basarh[20], several small ring wells, consisted of three rings with a total height of 15 inches and a diameter of 2ft. 6in. have been found. At Bhita[21], three wells have been noticed, in the excavations. One of them is assigned to 1st Cen. BC. The pottery rings are of 5ft. wide. Numerous wells are discovered at Brahmanabad[22] in Sindh of Cousen's excavations on the site. These are made of several pottery rings.

At Andhra site at Kondapur also have several such structures strewn over the Kotgudda mound[23], and Masso Dih[24], many of these are located on the higher and the lower ridges of the ancient mound. But the largest numbers of such wells are found at Rairh[25], where no less than 115 such wells have been traced in a very little space. The wells at sahet-Mahet[26] are similarly described. At Ujjain[27] numerous wells are spread over the site on the banks of the river Sipra. Two wells are found at Paharpur[28] in the Calcutta university excavations, in 1921-22, while the wells at Mahasthanagarh[29] were unearthed by the ASI in1928-29. The diameter of the rings out of which they are constructed is about 2ft. with an average height of 12 to 14 ft.

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19 Goswamy, *Excavations at Bangarh* (1983-41), University of Calcutta, 1948, P.200.

20 *ARASI*, 1903-04, p.62, Text figure-4.

21 *Ibid*, 1911-12, pp42-43.

22 Cousen, *Antiquities of Sind,* Vo. –XLVI, Calcutta, 1929, p.51, fig.-4, see also pl-VIII.

23 *IAR*, 1959-60, p. 42

24 *Ibid*,p.48.

25 Puri, *Excavations at Rairh*, (n.d) pp.14-17, PL-IIIa-e.

26 *ARASI*, 1907-08, p.110, PL-XXVII and XXXII.

27 *Admn. Report of the Arch.Dept. of Gwalior State*,1938-39,PL-XV,XVc and d.

28 *ARASI*, 1922-23, p.118, PL-XXVI.b.

29 *ARASI*, 1928-29, p.20, PL-XXXVIII,a-b.

From the examples cited above it would appear that the use of such ring wells has a very wide extant in India and from the chronology of the site, it seems that they were in vogue for a considerable length of time. Opinions, however, differ as to their exact usages. Some authors consider it to be used as granary[30]. Regarding the problem of use, it was very carefully investigated at Rairh[31], where 55 such wells were emptied. In none of them however any traces of decayed corn or vegetable matter were found. On the other hand, they were rich in numerous brickbats, pot-shreds and other smaller finds mixed with rubbish which clearly indicated that they were discards. Similar examples also come from Ujjain. Some of the wells at Taxila and Rairh, contained inverted water vessels[32] and this fact may also be taken into consideration while examining the nature of these wells as soak-pits.

After analyzing above facts we came to a conclusion regarding the construction and various uses of ring wells with the advent of time. Basically these are found for using in (a) pit latrines, (b) refuse pit for waste water soakage, (c) drawing water, and (d) storing grains.

A. Pit Latrines: Pit latrines of India are of two varieties, i.e. type-I and type-II, which are described below after studying some important sites in India.

Type-I:

Normally, Pit latrine type –I has two components – (i) a unlined dug out circular pit and (ii) Squatting arrangement to seat on. In the early phase of NBPW at Rajghat[33] (dated from Cir. 600 to 400 BC) and

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30 *IAR*,1960-61,p.51.

31 Puri, *op.cit.*(n.d), p.16

32 *Ibid* , p. 17

33 A.K.Narain and T.N.Roy, *Excavations at Rajghat, part-I, The Cutting, Stratification and Structures,* Varanasi, 1976, pp. 59-61.

other places as we seen earlier, were found and studied systematically. At Rajghat, these structures are gone down by cutting the occupational debris and natural soil, and reach below the water table. The outer sides of the pits were found filled with rough *Kankary* soil to avoid collapse of unlined pit wall.

These pits are constructed sufficiently deep so that the excreta may directly fall quite below in the sub-soil water. The second part (squatting sitting arrangement) might consist of two timber planks (now perished) for sitting comfortably over the pit. These pits are found filled with loose brownish earth and a coating of greenish moss on the sides along with NBPW and associated wares. The finds of some complete vases of dull Red ware like *lotas* inside these pits is having some significance. These pots were devoid of slip or wash and their fabric was so rough that they could not have been used twice. Hence it is not unlikely that these vases were used for carrying water for flushing and cleansing by persons who used this pit as latrines.[34]

Type – II:

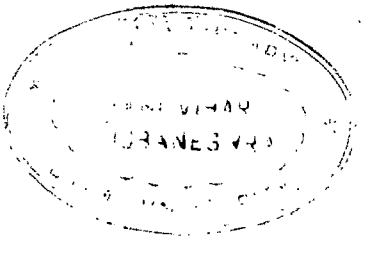
The second type of pits (nos.1, 2, 3 at Rajghat-II and Nos.8, 9, 10, 11, 12 and 13 at Rajghat-V) located all at Rajghat[35] and were also used as pit latrines by the people of early phase of NBPW. These pits are again having two components – (i) Unlined pit and (ii) squatting arrangement (made of perishable materials). But they differ from above mentioned pits in following respects.

(a) The diameter of these pits was larger (from 73 cm to 1.03 m.)

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[34] The use of such pits as latrines has been observed in certain parts of Uttar Pradesh even today. These are popularly called as dug-outs.

[35] Narain and Roy, *op.cit*, (1976), pp39-40 and p.53.



(b) These pits were cut into the natural soil only up to a medium depth of 4.36 m. Hence, these are constructed not to extend below the water label so as to remains dry and minimized the ground water contamination.

(c) They are located out side the main habitation area and lie close to each other. Because, one pit would be used until full and than sealed for the second pit is in use. When the second is almost full, the first pit would be emptied and put back into use. By alternating, the two pits can be used indefinitely. This provision, however, may avoid danger of spreading of diseases or contamination.

However, Type-I and II without any lining represent the initial stage in the evolution of so called ring wells, which is started use in a little later (about cir. 4th Cen. BC) within the same NBP period and profusely used in late phase of NBPW culture.

B. Refuse Pits:

We have one such evidence of a circular unlined pit, in the PGW label at Jakhera,[36] where it is located out side the house and was used as refuse pit. Similar evidence also came from Koldihawa[37], in the corresponding strata of the same age, for the disposal waste materials of every day use.

Such pits were also reported from the early phase of NBPW at Kausambi[38], Sravasti[39], Rjgir[40] and Bhir mound of Taxila[41].

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36 M.D.N.Sahi, "New light on the life of the PGW people as revealed from excavations at Jakhera", *Man and Environment*, Vol-II,Ahmedabad,1978, p.103.

37 *IAR*, 1979-80, p.45

38 *IAR*, 1955-56, p.20.

C. Ring Wells:

A high sense of sanitation was exhibited by the people of late phase of NBPW. Since concentrated urban settlements consider sanitation more of a problem, initial efforts to introduce better sanitation technologies are likely to be more effective in Urban than rural areas. Unlined pit latrines provided a satisfactory service in the early phase of NBPW, when the population was not so dense and sufficient open space all around the settlements was available.

But in the late phase of NBPW due to dense population, there required to develop in the field of sanitary engineering for the introduction of the so called ring-wells. These ring wells became distinguished from the early two types of pit-latrines (Type - I and II) in following grounds.

(i) It is being always lined with circular terracotta rings.

(ii) These rings were placed inside the pits for checking the collapse of the sides and contamination.

(iii) It shows advancement from type-I and II of early phase of NBPW to of simple Un-lined pit to encasing rings during the late phase of NBPW, which is an example of improvement in sanitation.

(iv) It also indicates the socio-economic status of the people.

(v) Besides the use of latrines, these ring wells were also used for various other purposes.

(vi) Ring wells is the characteristic features of late phase of NBPW culture. It has a wide spread distribution (discussed in chapter-II) and is still a living tradition in some parts of India.

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39 *IAR*,1958-59, P.50

40 *IAR*, 1954-55,P.16

41 Sir John Marshal, *Op.cit*,(1951), P.94.

Typologically, we got two varieties of ring wells in this late phase of NBPW, which are given below.

(i) The well of which were lined with earthen rings upto certain depth, below which the pit became narrowed and unlined; and (ii) The second one are those, which have earthen rings placed through out their vertical depth.

Ring wells, its method of construction[42], distribution, location and other detail description[43] are not properly dealt. Hence, some confusion about their origin and function still exist. However, after studying the ring wells at different sites, the theories regarding the functions are given below.

(i) Ring wells used as latrines:

The second type of ring wells with terracotta rings placed throughout their depth have been reported from a large number of sites having the following characteristic-

(i) Pits are excavated sufficiently deep into the natural soil or below the water table so that the excreta may fall deep. The absence of odour, fly and mosquito could be avoided in such construction.

(ii) These are encased with the earthen rings throughout their depth in ordepr to prevent the collapse of sides and also contamination of nearby area.

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42 R.N.Mehta, "Ring wells: Method of Construction", *Journal of the Maharaja Sayajirao University of Baroda*, Vol-XVII, No.1, Baroda,April,1968, pp137-140.

43 B.M.Pande, "Ring wells in Ancient India", *Bulletin of the Deccan college Research Institute,* Silver Jubilee Volume, Poona,1966, pp.207-219.

(iii) In some cases the upper part of the ring wells are lined with a few courses of wedge-shaped bricks so as to fit the wooden squatting planks to sit in the toilet.

To cite example under above category (ring wells used as latrines), the best evidences is from Hastinapura[44], where ring wells (Ring Well - 4) and (Ring well-2) were lined by wedge-shaped bricks at the top. It is noticed that a considerable portion of these were cut into the natural soil which suggest that the water table was not too far deep. At Rajghat, a ring well shows a similar type of superstructure[45]. This ring well lies close to a brick lined drain-C and belongs to Cir. 200 BC. One of the ring wells at Bhita also had similar superstructure and the pit was more than 6 mts. in depth[46]. This type of construction continued in the Pala period as evident from the site Bangarh[47]. At Brahmanabad[48] and Nevasa[49], the ring wells were dug much below the natural soil so as to extend below water table.

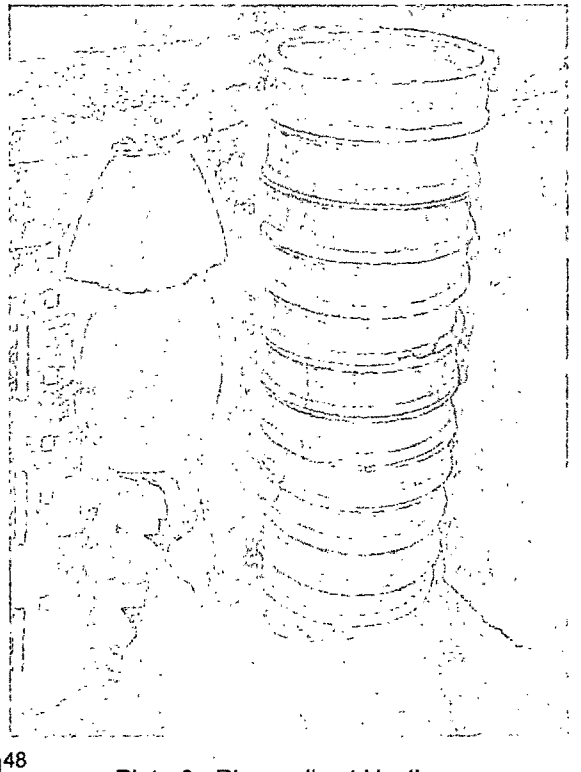


Plate-3 : Ring wells at Hastinapura, after Lal.

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44 B.B.Lal, "Excavations at Hastinapura and other Explorations in the Upper Ganga and Sutlej Basins, 1950-52", *Ancient India*, Nos.10-11, New Delhi, 1954-55, pp25-26, PL-XXIII and XXIV.

45 Narain and Roy, *op.cit*, (1976), PL-VI-A.

46 *ARASI*, 1911-12, p.33.

47 K.G.Goswamy, *op.cit.*, (1948), p.8.

48 *ARASI*, 1903-04, p.135.

49 Sankalia, Deo, Ansari and Sophia Erhardt, *Excavations at Nasik and Jorwe,* (1954-55), p.58.

These ring wells were designed to be used as latrines where the user was accustomed to the use of water for flushing and anal cleaning. Such evidence is corroborated by the evidence at Nevasa and Rairh,[50] where the ring wells were found coated with greenish moss due to constant contact with water flushed by the user accustomed for flushing and anal cleaning.

These ring wells, therefore, represent the final stage in the development of pit latrines in India. Despite the fact that these pit latrines in the initial stage of their evolution were used by the village communities in the early phase of the NBPW Period as early as 6th / 7th Cen. B.C., the so called ring wells (pit latrines with terracotta lining) made their appearance only in the riparian urban settlements of the Late Phase of NBPW Period by about 4th Cen. B.C. Its emergence and spread over a considerable part of India is conterminous with the late Phase of NBPW Period. They continued to be in use in the subsequent periods and the tradition of their being used either as latrines or draw wells still continues in some parts of India. Now with the initial stage in the evolution of these ring wells found in the form of pit latrines (Types A and B) in the early Phase of the same cultural deposit (NBPW Period). Hence we may look to the possibility of their indigenous origin within our country itself. It is quite unnatural that the ring wells started appearing in a fully developed form in the late phase of NBPW Period without any prior beginning. The main advantages of these ring wells being used as latrines are the following.

1. Unskilled labour is required for excavation of the pit and some skilled labour is required for lining the pit with terracotta rings, construction of superstructure of wedge shaped bricks and making of wooden planks for sitting over it.

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50 Puri, *op.cit*, (n.d.),p.-16.

2. All the construction material is locally available and is cheap. Since the construction of ring wells is very simple it may be largely left to the householder. Civic responsibilities if any, can thus be restricted to enforcing and assisting in the achievement of standard type of earthen ware rings (terracotta rings) if necessary.

3. Easy of maintenance and since the pits are deep they have a longer life than shallow pits.

4. The users have no fear of falling into it as it is throughout lined and cannot collapse. It is not possible to see the excreta as it is directly passed into the subsoil water.

5. Minimal water is required for flushing, cleaning of swatting planks and for anal cleansing.

6. Absence of odour nuisance and minimal fly and mosquito nuisance and hence minimal risk to health.

7. Suitable for these persons, if given the choice for an inside toilet.

Their main disadvantages are that they are unsuitable for very high density urban areas. They may pollute the ground water and also require the separate arrangements for sullage disposal.

This clearly suggests that ring wells excavated to sufficient depth reaching much below the natural soil may not be always put in the category of wells for drawing water. Similarly also those rings wells which have a superstructure of wedge-shaped bricks may not always be used as draw wells. Normally we find that these ring wells are present in large numbers (often in clusters) within a considerable small area. It is difficult to imagine so many draw wells within a specified area particularly on sites which are situated right on the bank of a river. Ring

wells are mostly located near a drain or a soak pit. There are also instances of twin ring wells in a large pit as at Tripuri[51] and Nevasa[52]. These ring wells which are constructed in the dry bed of a river, sandy areas, rocky ground or when the water table is high it may not be very deep. Then we have better devices for procuring water. Wells with lining of bricks had a wide spread distribution in space as well as time (dating back as early as the Harappa culture), are quite vogue and have been located on the same sites in which we have found these ring wells. Perhaps the need for these latrines particularly the ladies, the old, the sick and the children, if given the choice, opted for an inside toilet than the garden of alleys or nearby fields. Even today, in certain parts of India these ring wells are being used as latrines. However, we have definite evidences where these ring wells were also used as draw wells.

(ii) Ring wells used as draw-wells:

In this category, those ring wells which were unearthed inside a kitchen or a room or a courtyard and reaching the sub-soil water (except in sandy or rocky ground or when the water table is high) and having a pavement or surmounted by well-heads may generally be taken as wells for drawing water. At Sisupalgarh[53] and Bhita[54] the ring

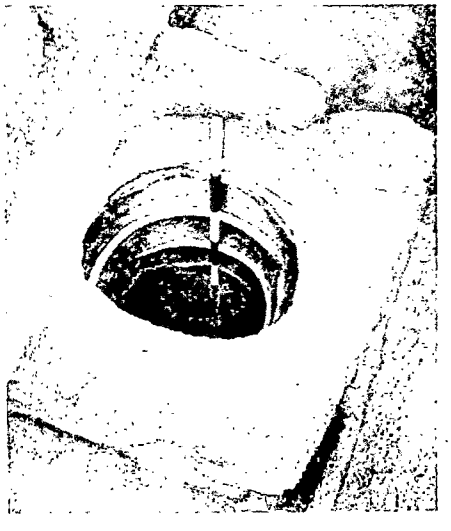


Plate-4 : Ring wells at Sisupalgarh

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51 M.G. Dikshit, *op.cit*, (1985),P.25.

52 H.D. Sankalia, *op.cit*,(1960), P.60.

53 B.B. Lal, "Sisupalgarh 1948 : An Early Historical Fort in Eastern India", *Ancient India*, No.5, New Delhi,1949,P.68

wells were capped by a stone with an aperture of the same diameter as that of the ring well. At the former site, rope-marks on the inner edge of the stone was also noticed which indicate that it was used as a draw well. Similarly at Rajghat, Kumrahar, Bangarh, Nevasa, Nasik, Besnagar, Rairh, Mahasthanagarh and Paharpur, a brick platform or stone pavement, serving an embankment for approach to the well have been noticed. The most interesting evidence was furnished by the excavations at Rajghat where a ring well was enclosed within a well laid brick pavement and located in between two house complex of the same period. This might have served as a draw well and its brick platform served the purpose of an embankment or provided an approach to the well[55].

The evidence at Rajghat is corroborated by Bangarh and Nevasa. At Bangarh, a ring well belonging to Pala Period was surrounded by pavements with bricks-on-edge and laid flat bearing the sockets for placing the pitchers.[56] At Nevasa, by the side of a brick well, a storage jar was found fixed over the remains of a brick-platform. Similarly at Nasik the excavator thinks that the stones dumped close to a ring well might have served as an embankment or an approach to the well. From the evidence of Bhir Mound, Besnagar, Brahmandbad in Sind and Ujjain, where ring wells were located inside a kitchen, we can say that they were used as draw wells. Such wells fitted with earthen rings are still in use in eastern India, Gujarat and parts of Uttar Pradesh.

(iii) Ring wells used as soak-pits:

These are a few instances where ring wells have been used as soak-pits. This is probably because we have other better as well as

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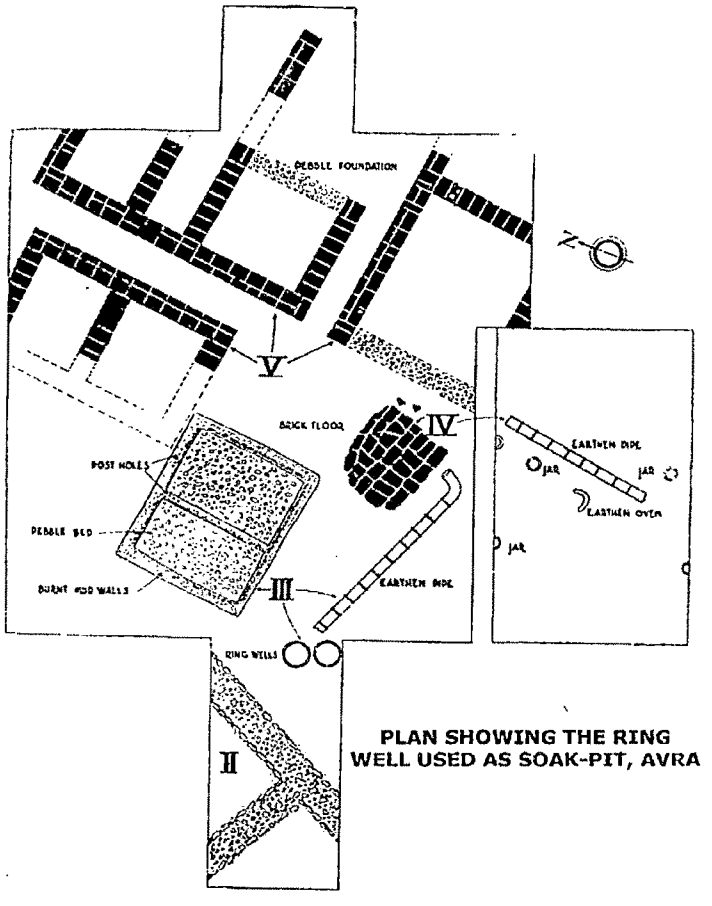
54 *ARASI*, 199-12, P.42.

55 Narain and Roy, *op.cit*, (1976), PL-XIII.

56 Goswamy, *op.cit*, (1948),p.8.

less economical means for disposal of sullage water. Drains in the vicinity of a ring well have been reported from Ujjain, Rajghat and Mathura but whether these were connected to the ring well in any way is not known.

Pottery drains quite close to the ring wells have also been found at Rairh but again we are not sure about their connection with the ring wells. The most unique evidence is from Avra[57] where a drain, 4.57m. long, made of terracotta pipes was found joined to the top of a ring well. This is the solitary but definite evidence of a ring well being used as a soak-pit.



PLAN SHOWING THE RING WELL USED AS SOAK-PIT, AVRA

Fig.-4 : Ring well used as soak pit, Avra after Trividei

(iv) Ring wells used as granary:

The evidence of granary made of terracotta rings are a few in archaeological context. The most important evidences are from Ahichhatra[58], and Pauni[59], where the ring wells are possibly used as

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57 H.V.Trivedi, "Excavations at Avra", *Journal of the Madhya Pradesh Itihasa Parisad*, No.IV, Bhopal,1962, p.19,fig.1,PL-III.

58 *IAR*, 1956-57, P.95.

storing grains. But in archaeological context there are some features which are to be marked while fixing a well to be used as granary. These features are, (i) the base of the ring well should have closed or solid by ramming the floor so as to act as platform over which the well is rests and could be easily differentiate from the surrounding area. (ii) To the base of the shaft of the ring well there should be a hole for easy drawing of grains. (iii) The lid (cover) is also an indication for ascribing the well as granary.

These were the use of ring wells in various purposes as evidenced from different excavated sites. Here we should discuss about different types of rings and their characteristics.

CHARACTERISTICS OF RINGS:

In the structural features there are two important aspects which are to be considered for the study of ring wells. These are-(a) Shape of the ring, and (b) Well-head. There are different types of rings and well-heads, forming a major component of a ring well with their respective functions.

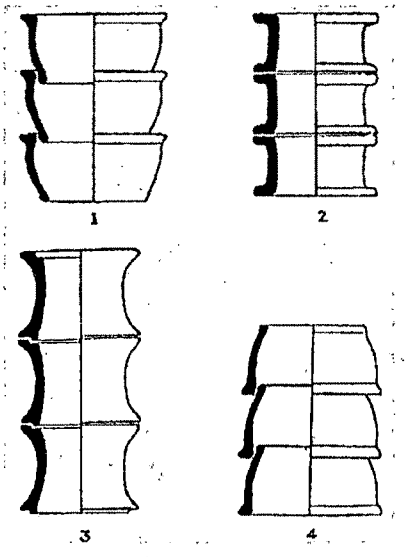


Fig.5 : Different types of terracotta rings.

(a) **Rings**: Basically the rings fall into four broad categories on the basis of their shapes. (i) rings with mouth splayed in such a way to fit into the lower edge of the corresponding upper ring; (ii) rings with wide and flat top and bottom; (iii) rings with grooves at both the edges for fixing the upper ring into the lower one firmly; and (iv) rings with a narrower top and broader

[59] A. Nath, *op.cit.* P-18

bottom. Technically the shape of the individual rings thus does not require any mortar or binding medium.

The height of the rings collectively of all the types varies from 10 to 22 cm, but the only exception being the ring wells at Arikamedu[60]. The heights of the rings ranging from 12cm. to 20cm. are found generally during 4th -3rd century BC. But the size of rings may not, in all cases, hold good in all sites. Rings with exceptionally large height (22cm. to 1.01mts.) were used at Arikamedu.[61]

Not much can be said about the thickness of individual rings due to paucity of published data; but the evidence from Rairh[62], Sahabazgarhi[63] and Hastinapura[64] shows the thickness of 1.27cm., 60 cm. and 5cm. respectively.

(b) Well-heads: Well- head as the name denotes refers to 'head of the well' and form a major component part of the well. While rings were placed below the surface, well-head rests over the surface of the earth. The construction of well-heads, in the form of a parapet wall, or placing a stone slab over the mouth of the rings or domical covers must have arisen in order to distinguish the well from the surrounding area. Such well-heads are reported with so many ring wells exposed at different archaeological sites in India. These well-heads are made in using different materials, i.e. - bricks, earthen-pots and stone slabs.

The wedge-shaped bricks used in the upper portion of certain ring wells and constituting above the then ground level must have formed part of the parapet wall around it. This might have been done in order to

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60 J.M.Casal, *Fouilles de Virampatanam-Arikamedu*, Paris, 1949, Annexe-III

61 *Ibid*, Annexe-III.

62 Puri, *op.cit. (n.d)*, p.15.

63 *ARASI*, 1921-22, p.65.

64 B.B.Lal, *op.cit* (1954-55), pp. 25-26, Pls XXIII & XXIV.

strengthen the upper portion of the ring wells, which is often prone to wear and tear, and also to prevent dirt and living beings falling inside the wells.

Thus, well-head is meant the upper portion of a ring well or its covering which remained above the ground and may be classified into following categories.

1. The upper parts of ring well partially constructed by bricks above the ground level.

2. Stone slab placed on the mouth of the ring well and having equal size of hole so as to fit with the upper ring of the well.

3. Loose domical cover of terracotta.

To cite examples under the first category, the most authentic evidence is from Hastinapura[65], where a ring well belonging to period-III, was surrounded by well-head made of wedge-shaped bricks to a height of five courses. At Bhita[66] had also similar construction of upper seven feet.

Examples of second category are available from Sisupalgarh[67] and also from Bhita.[68] At the former site, the ring well was capped by a square stone with an aperture of the same diameter as that of ring well. Rope-marks on the stone also are noticed on the inner edge of the stone. Ring well at Bhita also was capped by a well-head.

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65 *Ibid.* pp. 25-26, Pls-XXIII & XXIV.

66 *ARASI*-1911-12, p.33.

67 B.B.Lal, *op.cit.* (1949), p.68, PL-XLTA.

68 *ARASI*,1911-12, p.39.

In the third category, the only example is from Tripuri.[69] It is of a domical lid made of terracotta.

PHYSICAL DEVELOPMENT OF RING WELLS WITH ADVENT OF TIME:

After analyzing various excavated sites of early historic sites in India it is found that ring wells emerged through a process of development in water management system. The sites like Hastinapura, Bhita, Taxila, Tripuri, Rajaghat and many others gave some important information regarding the physical development of ring well with march of time. There are given below.

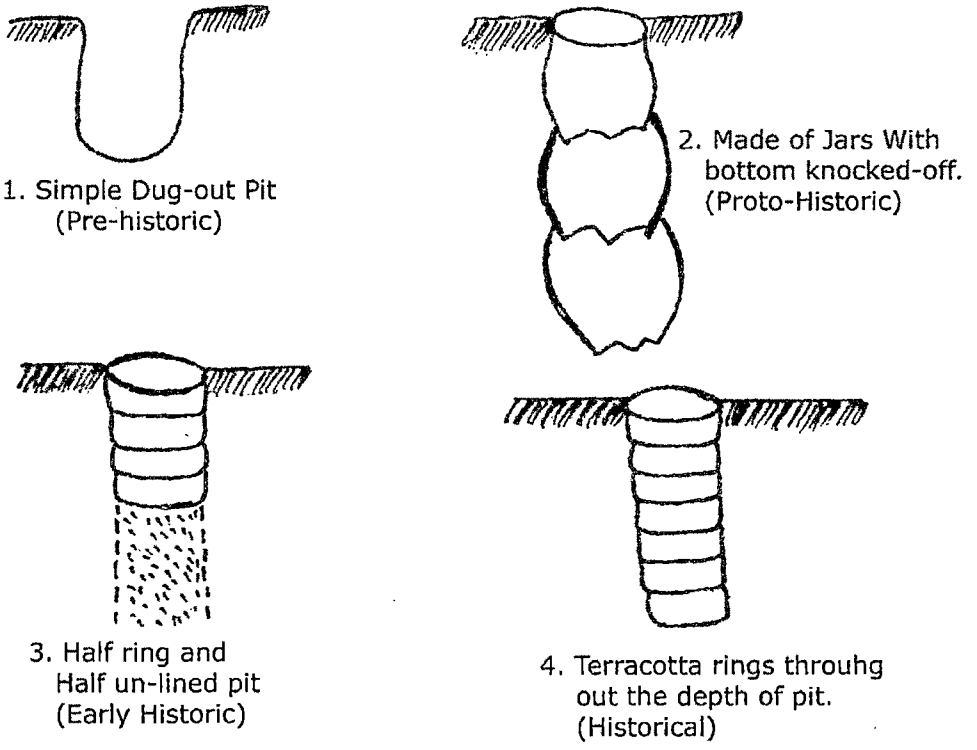


Fig.6 : Physical development of terracotta rings with advent of time

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69 M.G.Dikshit, *op.cit*,(1985),p.23.

CHAPTER – IV

RING WELLS IN ORISSA

RING WELLS IN ORISSA

Being one of the earliest regions, Orissa has rich centres of urban character. The geographical position of Orissa has contributed a lot to the development of maritime activities. The river system and the sea belt of the Bay of Bengal were favorable for inland and overseas trade. This led to the development of a good number of cities and urban centers on its coastal and other regions. Though many of them had lost their name and fame, they still survive in stone inscriptions or in copper plate grants.

There are different explanations for urban growth, development and decline of a particular region. But not a single cause could independently be sufficient to transform a rural settlement into an urban centre. However, urbanization and its features evolved neither naturally (without any planning) or with deliberate planning from the beginning which can be traced to a house, a royal palace, a temple, a big self sufficient village, a market or a camp and to a natural setting of a locality such as river bank, a confluence of rivers, a sea coast, a crossing of highways, a mountain valley and so on.[1]

In Orissa, as elsewhere in India, majority of towns and cities (*puram* and *nagaram*); house (*grha*); market (*hattadi*); royal residence (puri); port (*pattanam*); camp (*katakam*); highways (*pattam*); commercial centre (*nigama*); temple (*mandiram*); are originated from villages, located in different geographical location and rose to eminence in due course of time with developed planning under the patronage of royal monarchs.[2] Once a particular region or localities developed into urban

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1 B.B.Dutta, *Town planning in Ancient India*, Calcutta, 1925, p.20.

2 H.C.Das, "Urban Centres in Ancient Orissa (3rd Cen.BC. to 7th Cen.AD.)", *OHRJ*, Vol-XXIX, No.2&3, Bhubaneswar, 1983, p.75.

centres, they were provided with necessary urban amenities like regular street, public drain, market complex, fortification, temple complex and monasteries, etc. A few urban centres of Orissa have come up through archaeological excavations and explorations.

The ancient and medieval history of Orissa are replete with various examples of township[3] developed by different authorities on the crossing of highways (like- the forts of Tosali, Raibania, Amarda, Amaravati, Jajpur, Chadwar etc.); on the sea-shore (like- Che-li-ta-lo, Palur, Kalinganagar, Tamralipti); on the mountain valley (like- Jaugarh, Maraguda, Bualigarh etc.); on the river valley (like- Viratgarh, Haripurgarh, Manamunda, Kharligarh, Asurgarh etc.) and also ancient religious centres like Puri, Bhubaneswar and Khiching etc.

Before discussing the urban centres in ancient Orissa in detail, we have to know different divisions and names of Orissa. According to Pliny[4], the whole coast from the Ganga to the Godavari had three divisions i.e- from the Ganga to Mahanadi, from the Mahanadi to Rushikulya and from the Rushikulya to the Godavari. *Mahabharata* refers that the Vaitarani flows through the Kalinga[5]. At that time the chief towns of Kalinga were Manipura, Rajapura and Rajahmundry[6]. Hsuan Tsang witnessed some tens of towns in the Kalinga country and states that the country *boarding* on sea, abounds in many rare and valuable articles. Kalinga or the coastal Orissa, south of the Mahanadi river, rose to prominence under Asoka, the Maurya. During his reign Kalinga was treated as an important territory in India. But the state hood was solid only in the 1st cen. B.C., when it showed manifold development of Kalinga, which is clear from Hatigumpha inscription (near

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3 *Ibid*, p.76.

4 S.N.Majumdar(ed.),*Pliny's Ancient India*, Calcutta, 1927,pp.38-46.

5 J.W.Mc Crindle, *Ancient India*, pp.137-144.

6 H.P.Chakraborty, *Trade and Commerce in Ancient India*, p.142.

Bhubaneswar) of Kharavela [7]. In the 1st and 2nd cen. AD., the ports of Orissa carried on brisk trade in pearls, ivory and muslin with foreign countries.[8] In the 4th cen. AD., Kosala and Mahakantara figure in the list of conquest made by Samudragupta[9], which is now mostly the south-western part of Orissa. From the second half of the fourth century to the sixth century AD, several states were formed in Orissa. Out of which Matharas were important among them. They dominated the area between Mahanadi and Krishna. During this period, the expansion of trade and commerce led to the growth of different urban centers. Epigraphic records inform us the places of importance[10] like Sripura, Sunagarh, Vardhamanpur, Simhapur, Bijaypur, Pishtapur, Devapur, Sarapalli etc.



R.D.Banerjee[11] is of opinion that the people of Kalinga were the pioneers of Indian colonization in farther India and the Indian archipelago. The trading centers of Orissa in due course of time were converted into a number of cities or urban centres. These urban centres were the product of the small market- towns[12] and these market-towns developed from the village *hatas* (Village market), which acted as direct link among the cultivators, peasantry, craftsmen

7 D.C.Sircar, *Select Inscriptions*, p.207.

8 B.S.Das, *The Economic History of Orissa,* p.35.

9 N.D.Valenkar(ed.), *Raghuvamsa of Kalidas,* Bombay,1948, pp.58-60.

10 B.S.Das, *op.cit.*,p.44.

11 R.D.Banerjee, *History of Orissa*, Vol-I, p.108.

12 Suman Kumar, "The social evolution of Indian Market" in *History and Culture,* pp.306-308.

and artisans. In 3rd cen. BC. to the 4th cen. AD., development of trade led the growth of different urban centres in the various parts of Orissa. The places where the commodities were exchanged are converted into the towns or cities[13]. The literary and archaeological sources give the evidences of number of towns and cities in different parts of Orissa during ancient days.[14] The centres like Srikshetra (Puri), Ekamrakshetra (Bhubaneswar) and Guhadevapataka or Guhesvarapataka (modern Jajpur) rose to a centre of religion; Pithunda, Paloura, Dantapura, Che-li-ta-lo, Pipli and Ganjam developed as port-cum-market towns; Puspagiri, Ratnagiri, Udayagiri developed as centres of learning and places like Kalinganagari (Sisupalgarh), Tosali, Samapa, Khijingakotta and Avinava Varanasi- Kataka flourished as administrative centres.[15] Almost all of them have yielded to the ravages of time.

After excavations, different ancient sites and some urban centres of Orissa have come into public notice. Here some of the important early historic excavated and explored sites having urban characters are given to know the cultural importance with their location.

SISUPALGARH:

The early historical city of eastern India, Sisupalgarh near Bhubaneswar has brought to light the remains of a great and well-planned fortified town which flourished from the 3rd cen. BC. to the 4th cen. AD.[16] It is one of the ancient cities of Kalinga, evidenced a planned structural activities. Each side of the fort measures about three quarters of a mile. There are eight large gateways, two on each side and other

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13 P.C.Prasad, *Foreign Trade and Commerce in Ancient India*, pp.68-69.

14 R.Shamasastri(ed.), *Arthasastra of Kautilya, 1991,p.75.*

15 D.K.Ganguly, *Historical Geography and Dynastic History of Orissa*, pp.20-21.

16 B.B.Lal, "Sisupalgarh-1948: An Early Historical Fort in Eastern India", *Ancient India,* 1949, pp.62-105.

narrow openings. Such type of structural activities clearly indicate regular planning not only of the fortification but also of the streets inside the city, which are likely to have run east-west and north-south connecting the opposite gateways in a grid pattern.[17]

From the excavation several datable materials were recovered. The main pottery included Black-and Red Ware, bright Red Polished Ware and plain Red Ware.[18] Sherds of Rouletted Ware also found.[19] The other important finds which give an urban touch to the place include semiprecious stones, bangles of glass and ivory, numerous terracotta seals, sealing and terracotta bulla. The excavation revealed different cultural phases, i.e. Period-I (cir. 300-200BC.) early period; Period-IIA (cir. 200BC-100AD) early middle; Period-IIB (100-200AD) late middle; Period-III (200-350AD) late period.

On the basis of circumstantial evidences, presumably Sisupalgarh being identified with ancient Kalinganagari, which was the capital city of both Mauryas and Chedis in the name of Tosali[20] and Kalinganagari[21] respectively.

JAUGARH:

Jaugarh otherwise known as ancient Samapa[22] was important urban centre during the time of Asoka. It is situated on the bank of river Rishikulya in Ganjam district and referred to in the separate Kalinga

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17 *Ancient India*, No-9, p.169.

18 K.N.Mohapatra, "Tosali, a famous Buddhist centre of Orissa", in H. C. Das (ed.), *Buddhism and Jainism*, 1976, pp100-101.

19 B.B.Lal, *op.cit*,(1949), p.169.

20 N.K.Sahu, *Utkal University History of Orissa*, vol-I,1964, p.123.

21 *IAR*,1956-57,p.30.

22 E.Hultzch, *Corpus Inscription Indicarum*, Vol.I, Oxford,1925, pp.92-100.

Edicts[23] of Asoka to be the capital of the south-western part of Kalinga during the reign of Mauryas. The excavation undertaken by the ASI, brought to light a well-planned and fortified township.

The presence of Neolithic celts above the natural soil associated with Black-and-Red Ware potteries suggest that, Neolithic culture flourished long before the historic culture.[24] The first period, represents a full-fledged iron using culture, and the plain potteries devoid of painting are also noticed. The second period is marked for brick and stone structures. The finds include decorated potteries, fine specimens of the beads of stones, shell, terracotta and iron objects. Punch-marked and Puri-Kusana coins are also found.

The town is encircled by a fortification wall built of earthen rampart consisting of laterite gravels, stone-chips and hard earth. The town was square on plan, each side measuring approximately half a mile in length. The occurrence of Puri-Kusana coins is an indication of the prosperous condition of the township. The date of occupation of the fort may be assignable to the period between 3rd cen. BC and 2nd cen. AD.

ASURGARH:

Asurgarh an ancient fort in Kalahandi district of Orissa, is situated three km. west of Narla railway station. The fort is square on plan, provided with four gates on each side. The fort is encircled by a moat which is fed by the vast tank at the time of shortage of rain water. On the western side of this fort flows the river Sandul. On the basis of numismatic remains and excavated materials, the fort is dated from 3rd century BC. to the 5th cen. AD.

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23 H.C.Das, *op.cit* ,p.85.

24 *IAR*, 1956-57, p.31.

In 1973, partial excavation[25] of the fort was undertaken by the P.G. Department of History, Sambalpur University. Two trenches were laid out, one in the eastern part and the other in the western part of the residential area of the fort. The excavation yielded paved house floor, iron objects, beads of valuable stones like agate, chalcedony, coral etc. Punch-marked silver and copper coins, Black-and-Red Ware pottery, terracotta ornaments, glass bangles are also recovered from the excavation.

Layer-1 contains, the iron objects, semiprecious stones, fifty punch-marked coins of pre-Mauryan and post-Mauryan character. Layer-2[26] (1st cen. AD to 4th cen. AD) contains decorated potteries, semiprecious stone beads, Kusana pottery and copper coins of Kaniska. And Layer-3 (5th cen. AD) contains Red and Black potsherds.

According to excavator, Asurgarh seems to be an important area of Attavika people of Asokan Edicts. The recovery of NBPW[27] and the similarity of some punch-marked coins of Asurgarh with those of Bijnor and Palia near Kausambi, Ahichhatra and Hastinapura[28] in north India suggest some contact during Mauryan times. It was also commercial centre located on the high road joining south Kosola and Mahakantara with Kalinga.

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25 *IAR*, 1972-73, p.27.

26 B.P.Sahoo, *Prehistory and Early Historic Archaeology of Orissa*, Un-published M.Phil. dissertation, History department, Delhi University, 1979, p.125.

27 K.K.Basa, "Neolithic and post-Neolithic cultures of Orissa: An overview" in S.Pradhan(ed.) *Orissan History Culture and Archaeology*, New Delhi, 1999, p.20.

28 N.K.Sahu, "Asurgarh", in S.C. Behera (ed), *Interim Excavation Report*, Sambalpur University, 1982, P.27

MANAMUNDA:

In western Orissa, Manamunda is another important ancient urban site. It is situated on the right bank of river Mahanadi at a place where it is joined with river Tel in the present Baudh district of Orissa. The site was excavated in 1981-83 and 1990 sessions and it revealed cultural sequence from 3rd century BC to post-Gupta period[29]. According to Mishra and Pradhan, there are two cultural phases, i.e. period-I and period-II. While period-I has two sub-phases-I (A) associated with layer-4 and I (B) with layer-3.

Period-I (A) yielded Black-Polished Ware, Red-slipped Ware, iron objects, copper rings and a few microliths. Period-I (B) yielded Red-slipped Ware, Black ware, Black-and-Red ware. The important discovery is a silver punch-marked coin datable to 3rd cen. BC. Period-I also characterized by discovery stone circles with bone pieces, Black-and-Red Ware and iron objects, which led the archaeologist to assume that it was a Megalithic burial. Another important feature of this period is the Black-Knobbed Ware. This period tentatively assigned to 4th -3rd cen. BC.

Period-II associated with layer-1 and 2 yielded inferior Red Ware which is heavily weathered and represent an ochre colour. This degeneration of the ceramic implies a general degradation of settlement pattern.

MANIKAPATANA:

The site Manikapatana is located in Brahmagiri Tehsil of Puri district. The village has a 13th century Siva temple and a Muslim tomb of medieval period. The site was partially excavated in 1989-90 and1992-

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29 S.C Behera, *Interim Excavation Report*, Sambalpur University, 1982, P.16.

93, under the joint collaboration of Orissa Institute of Maritime and South-East Asian Studies and the Department of State Archaeology[30] of the Govt. of Orissa. The complete sequence of the cultural horizon could not be determined as the digging did not reach to the natural soil.

The excavation revealed the cultural deposit of two periods, Period-I and period-II. Period-I yielded two celts, two sherds of Rouletted Wares, fragments of an amphorae, two Puri-Kusana copper coins, a sherd with Kharosthi script with legend "*Dasatradeva* and *Khida*", pottery with stamp designs, sprinklers, Kaolin pottery and thirteen terracotta ring wells have been exposed. Broadly this period may be dated from 1st cen. BC to 5th cen. AD.

There is a hiatus between period-I and period-II with a sand deposit of two mts. The notable finds of period-II are Chinese Celadon Ware, Chinese copper coins with square perforation with writing of Chinese character, Chinese porcelain, Ceylonese copper coin with legend "*Simad-Sahasamalla*", Burmese pottery, Egg-White-Glazed pottery possibly from Arab country. Apart from this large number of terracotta beads, iron implements such as- harpoons, spear heads, sickles, fish-hooks, boat-nails, terracotta bangles, glass and conch shells, copper coins of Mughal, terracotta lamps in various sizes were noteworthy finds of this site.

In the habitation area no complete structure was found. However, below 1.10 mts. a stone structure of wall made of khandolite is encountered. The remains of a circular structure have been exposed in the south-west corner of the trench below 1 mt. It is made of local sandy clay. The excavator thinks that the circular structure was possibly a

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30 D. Pradhan, P.K. Mohanty and J. Mishra, "Manikapatana an Excavation Report", *Puratattva*, No. 26, 1996, pp.120-23.

grain bin. The deposit of period-II can be dated from 9th cen. AD to the early part of the 19th cen. AD.

RADHANAGAR:

Radhanagar located in the Dharmasala Tehsil of Jajpur district, on the right bank of the river Kimiria, a tributary of Brahmani. The site is a fortified settlement, roughly square in appearance, measuring 1250 mtrs. on each of the side. Brick size of (46x30.5x9 cms.), earth with large and medium size laterite blocks were used for the construction of the fortification. The average height of the rampart is four to five mtrs. and width of forty mts. The fortification consists of two gateways, one in the northern and another in the southern side. From the explorations, so many objects like- potteries, ornaments, lamps, coins, iron objects and other household articles are found. Ceramics of Radhanagar constitutes two major forms, the coarse grit tempered hand made pottery and medium to fine texture wheel-made pottery of various colours and shapes. The occurrence of hand-made coarse grit tempered ware shows some amount of continuation of Neolithic tradition into the early historic period.[31] The exciting discovery from the site include ear-ornaments, a terracotta cart wheel, terracotta intaglio, a copper coin of Kusana imitation, two terracotta beads and a bead of cherty quartzite, a lamp of dark grey ware in fish-shape and a few bone fragments.

The survey at the site has also revealed a large number of terracotta tiles with perforations, which are again significant to differentiate the life style of the rich urban communities from surrounding rural population. However, there is no evidence of

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31 J. Mishra, "Radhanagar : Early Historic Buddhism, Urban Structure and Trade" in K.K. Basa and P. Mohanty (eds.), *Archaeology of Orissa,* Vol.-II, New Delhi, 200, pp. 507-550.

contemporary rural settlement as because of human interference and deep ploughing.

KHARLIGARH:

The fort of Kharligarh[32] is situated in Tentulikhunti block of Bolangir district, on the confluence of Tel and Rahul rivers. The fort is almost square in plan, circumscribed in the north, east and south by the rivers as the natural defense and in the west by an excavated moat connecting both the rivers. The fort consisting of burnt bricks (14 inch x 8 inch) existing to a height of 15ft. from the ground level. The notable collections from this site included Black-and-Red pottery, beads of various stones, iron objects of war and peace, Neolithic tools, metallic bangles and copper Kusana coins etc. in the year 1967. The central part of the fort contains a ruined structure, probably for the presiding deity of the fort.

The northern rampart has been greatly denunded by the river at the basement of stone gravels topped by brick wall of about 15ft wide. On the ground of finds, particularly the Kusana coins and the structural remains, it can be dated between 2nd cen. BC. to 4th cen. AD.

After discussing the early historical sites in Orissa, it is for better understanding a chart is given below to see the urban features of Orissan sites with relation to terracotta ring wells, fortification use of burnt bricks etc. and other traits of urbanization.

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[32] S. Pradhan, *Kharligarh Excavation: A Preliminary Report*, P.G. Dept. of History, Sambalpur University.

TABLE SHOWING THE URBAN FEATURES OF ORISSAN EARLY HISTORIC SITES, WITH RELATION TO RING WELLS

Sl. No.	Site	Urban Features									Geological Location	Nature of Site	Exploration Or Excavation	Time frame	Cultural phases	Published Ref.	Remarks
		Fortification	Brick structure	Craft Specialisation	Drainage system	Currency	Script / writing	Trade	Ring wells	Metal use							
1.	Sisupalgarh, Puri	✓	✓	✓	✓	✓	✓	✓	✓	✓	Highway, river bank	Fort site	Excavated	3rd Cen. B.C. to 4th Cen.A.D.	Single cultural site	Ancient India No.5 pp62-105	Urban
2.	Jaugarh, Ganjam	✓	✓	✓	✓	✓	✓	-	-	✓	River Side Highway	Fort site	Excavated	3rdCen. B.C. to 2ndcen A.D.	Multi-culture,	IAR, 1956-57, pp.-30-31	Urban
3.	Asurgarh, Kalahandi	✓	✓	✓	✓	✓		✓	-	✓	Highway, River	Fort site	excavated	3rd cen. B.C. to 5thcen A.D.	Single cultural site	IAR, 1972-73, p.27	Urban
4.	Manamunda, Boudh	-	✓	✓	-	-	-	-	-	✓	River	–	Excavated	3rd BC to Post Gupta	Single cultural site	IER, S.C. Behera (Ed), Sambalpur Uni., p.16	Quasi Urban
5.	Manikapatana, Puri	-	-	✓	-	✓	✓	✓	✓	✓	Sea Shore	Port Site	Partially excavated	1st cen. BC. to 19thcen A.D.	Not reached upto the Natural soil	Puratattva, no.26, pp.120-123	Semi Urban
6.	Radhanarar, Jajpur	✓	✓	✓	-	✓	-	-	✓	✓	River	Fort & port	Exploration	Neo Lithic to early historic	Multi Cultural	Archa. of Orissa, Vol-II, pp.507-550	Semi Urban
7.	Kharligarh, Bolangir	✓	✓	✓	✓	✓	-	✓	-	✓	River, Hill	Fort	Partially Excavated	2ndCen B.C. to 4thcen A.D.	Single cultural	OHRJ, Vol-XXIX, No.2&3 pp75-96	Semi Urban

Process of Urbanization in Orissa:

After a thorough study a presumption that Orissa's urbanization associated with a simple society of prehistoric time to a complex society in historic period. There are so many prehistoric sites in different parts of Orissa, especially in hilly track of western Orissa, showed their settlement hierarchy (the only study at Bonaigarh)[33]. Mostly Neolithic artifacts are found both in hill and coastal plain, where as Palaeolithic restricted only to hilly areas. Since plateau and plain land are suitable for agricultural activities and domestication, domesticated rice has been reported from Baidipur.[34] With the emergence of Chalcolithic culture both in hilly region and coastal plain, evidences of settlement give a further scope of the study in the sites like-Sankerjang, Kuanr, Bagda Pidha in the interior and Golbai, Gopalpur in the coastal area. The period is associated with the expansion of agrarian base as known from the plant remains of rice and *kulthi* from Golbai.[35] Moreover, this period is associated with art and craft specialization, which produce different kinds of potteries. The Chalcolithic evidences show there are different craft specialists, i.e. the potters, bone-tool makers, metal workers and bead makers. All these factors imply a more complex social and political organization with a stratified society in Orissa.

In the succeeding early historic phase, there emerged the state and urbanization which is a further extension of the process of the earlier period. The early historic fortified settlements at Sisupalgarh,

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33 P.K. Behera, "The Pebble Tool component of the Bonaigarh complex :Orissa", *Man and Environment*, Vol.-12, No.2, pp. 57-63.

34 B. K. Thapar, *Recent Archaeological Discoveries in India*, UNESCO, 1985, P.45.

35 B. K. Sinha, "Golbai : A Protohistoric Site on the Coast of Orissa", in K.K. Basa and P. Mohanty (eds.), *Archaeology of Orissa* Vol.-I, New Delhi, 2000, pp.322-348.

Jaugarh in coastal Orissa and Asurgarh in western Orissa show both the expansion of size of settlement and the urban features.[36] The finds of Punch-marked coins along with other coins and various foreign potteries from early historical sites implies that the trade and exchange were in vogue.[37] Manikapatana, Khalkatapatna were important ports for sea-trading with different countries. Hence, all these social phenomena were becoming more complex than the proto historic period. However, the excavations of early historic sites (earlier discussed), show the emergence of urbanization, specialization in art and craft along with other urban features. Through the tabular study, it is known that out of eight excavated and explored early historical sites, urban features are more or less have touched to every individual site. The urban growth mostly concealed with the time frame of 3rd cen. BC. to 5th cen. AD.

Whatever may be the causes and factors proposed by different authors like Alchin[38], Ghosh, Thakur and others, urbanization is not an abrupt phenomenon rather it is a process, somewhere from the establishment and in others with a single culture. So it is convincing that Orissan urban centres are basically a post-Mauryan phenomenon. For better understanding a chart is given below showing some excavated sites in Orissa to know whether the culture of every individual site is independent or developed from preceding culture.

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36 K.S. Behera, "Maritime trade in Ancient Orissa", in M. N. Das (ed.), *Sidelights on the History and Culture of Orissa*, Cuttack, 1977, pp. 115-21.

37 F.R. Alchin, "City and State Formation in Early Historic South Asian", *South Asian Studies,* 5, 1989, pp. 1-16

38 *Ibid*, p.18.

TABLE - 2
ORISSA : EXCAVATED SITES

	Sl. No.	Sites	Location	Period	Whether evolved into Early Historic urbanization	Published Reference
PREHISTORIC	1.	Baidipur, Dt.Majurbhanj	Near Baripada	Neolithic	No	R.D. Banarjee, History of Orissa, Vol-I, Calcutta, 1930, pp.39-40.
	2.	Kuchai, Dt.Mayurbhanj	8 km north of Baripada	Mesolite and Neolitiic	No	B.K. Thapar "Pre Historic & Protohistoric Ramains from Food gathering to Food Producing", in N. Saho (ed), Orissa Review, Bhubaneswar, 1976, pp.1-14.
	3.	Bajpur and Kamparkaal, Dt.Angul	—	Neolithic	—	K.K. Basa, Archaeology of Orissa, Vol.1, 2000.
	4.	Bonaigarh, Complex, Dt.Sundargarh	—	Neolithic	—	Purattatva, Vol. 22, 1992, pp. 124-32, Man & environment, vol.12, No. 2, 1992,pp. 57-63.
	5.	Girla, Dist. Koraput	Upper Indravati Basin	Mesolithic	—	S.C. Nanda, the upper Palaeolithic and Mesolithic Cultures of the Indravati valley, south Orissa : An Ethnoarche. Study in K. K. Basa & P. Mohanty (eds.) Archaeology of Orissa, New Delhi, 2000, pp. 161-167.

METALAGE	6.	Sankerjang, Dist Angul	Northern Bank of the Stream Pandiani, a tributary of Brahmani.	Neolithic Chalcolithic c14 (CAL. 795 BC)	No	R. N. Das, "Sankarjang – A chalcolithic site in Orissa", OHRJ, 32, 1986, pp. 99-125.
	7.	Golbai, Dist Puri	Bank of River Malaguni	Neolithic & Chalcolithic (2100±100 B.C)	–	B. K. Sinha "Exca. At Golbai Sasan, Dist. Puri, Orissa" Puratattva, 23; 1993, pp 48-50.
	8.	Kuanr, Dist. Keonjhar	Western side of N.H.6 to the north of the village Kuanr.	Chalcolithic	–	Ranjan Ray "discovery of Chalcolithic site near the source of River Baitarani, Orissa", Journal of Indian Anthropological Society, 28, 1993, pp. 97-101.
	9.	Khanbesvonipalli, Sonepur	A Km. from the Tehsil head Quarter of Birmaharajpur	Chalcolithic	–	"New Aspects of History of Orissa", Vol. VIII, 1998 (Jyotivihar), pp. 1-12.
	10.	Sisupalgarh, Dist. Puri	–	3rd cen. B.C. to 4th cen. A.D.	No	Ancient India, No.5, pp.62-105

EARLY HISTORIC	11.	Jaugarh Ganjam	—	Neo. To E. Hist. (2nd cen. A.D.)	Yes	IAR, 1956-57, pp.30-31
	12.	Manikapatna, Dist.Puri	Brahmagiri Tahsil	1st cen. B.C. to 5th cen. A.D.	Not reached upto natural soil	Puratattava No.26, pp.120-123
	13.	Asurgarh, Kalahandi	Three km. west of Norla railway station	3rd Cen. BC to 5th Cen. A.D.	No.	IAR, 1972-73, p.27
	14.	Manamunda, Dist.Boudh	Right bank of river Mahanadi	3rd Cen BC to Post Gupta pd	No.	IER, S.C. Behera (Ed.) Sambalpur University, p.16
	15.	Kharligarhikalahas	Tentulikhunti block of Bolangir dist	2nd Cen BC to 4th Cen AD	No.	OHRJ, Vol-XXIX No.2 & 3, pp.75-96
	16.	Moraguda, Nuapada	To the north of Sunabeda Plateau	—	—	K.K. Basa, Archaeology of Orissa, Vol.I, 2000, pp.418-430.
	17.	Khicking, Dist. Mayurbhanj	Western part of the Similipal massif in central Mayurbhanj	E. Hist. of this site is of 2nd C.A.D.	—	JBORS, 12(2), 1927 pp. 131-136

	18.	Sitabinji	Keonjhar	–	–	P. K. Mohanty, "A note of Sitabinji," Indica, 25(1), 1988, pp. 11-14.
	19.	Lalitgiri, Dist. Jajpur	Near the Birupa Chitrotpala Valley	2nd Cen. BC to 13th Cen. AD	–	K.K. Basa, Archaeology of Orissa, Vol. II, pp.458-461
HISTORIC MEDIEVAL	20.	Ratnagiri, Dist.Jajpur	–	7th & 8th Cen AD	–	IAR, 1958-59 pp.3-35
	21.	Lalitgiri, Dist. – Jajpur	–	6th cen. AD to 13th Cen. AD	–	G. C. Chauley, "Exca. Remains at Lalitagiri, A Buddhist site in Orissa, in K. K. Basa & P. Mohanty (eds.) Arch. Of Orissa, pp. 441-455.
	22.	Udayagiri-I, Dist. Jajpur	Horseshoe shaped valley is near Birupa	7th – 8th Cen. A.D	–	J.S. Niam, "Notes on the excavations of Udaygiri and Khalkatapatna" in K.K. Basa (Ed), Arche. Of Orissa, Vol. II, pp.495-506.
	23.	Barabati, Dist. Cuttack	Lies at the central delta of Mahanadi and western part of the present Cuttack	Medieval 13th /14th Cen AD	–	K.V.B. Rao, "Exca. At Barabati Fort, Cuttack" in K. K. Basa (eds) Archa of Orissa, Vol. II, pp. 63-680.
	24.	Chawdwar, Dist. Cuttack	–	Medieval	–	Personal communication
	25.	Languid, Dist. Jajpur	–	Historic	–	Personal communication

RING WELLS IN ORISSA: A CASE STUDY

In the field survey, we noticed ring wells are mostly found in the coastal districts of Orissa. Almost all the villages of Orissa and particularly in the districts of Puri, Kendrapada, Jajpur, Jagatsingpur are dotted with ring wells which are still using by the people. For the convenience, we surveyed some Tehsils and blocks of Jajpur district. Ethno-archaeological study is also conducted in this area as because some specialized people (a section of society) are also preparing the terracotta ring wells at present.

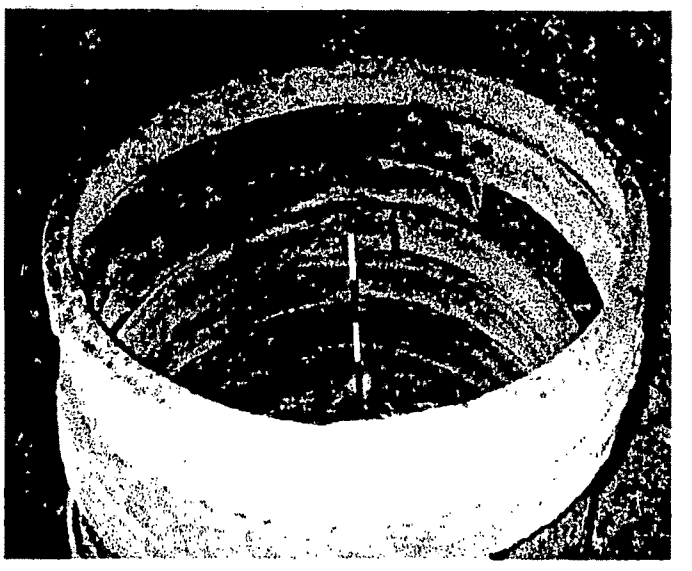


Plate – 1: Rings found from Kumari Colony, Dharmasala, Jajpur.

To know the different technical aspects of ring wells, here a survey report is given below.

1. Kumari colony, Jaraka, Dharmasala:

To the north-west of Jaraka market, and near the Dharmasala women's college, located the Dhauli hillock. On the foot-hill of this, a place called Kumari colony is located. In that locality the population is very thin and mostly are of colonized. The actual inhabitants are potters, which are presently also engaged themselves in their traditional livelihood in manufacturing different pots and household earthen-utensils except terracotta rings, which are now in less produced due to less demand in their locality. But the people have not forgotten the art of

manufacturing the terracotta ring wells, whose evidence are found in these areas in a scattered condition.

One such evidence comes from the premises of one Rabindra Sahu, where a series of rings numbering seven are found one above the other and a few broken pieces are lying near by it. The measurements are—

Diameter- 100cm.

Height(ring)- 12cm.

Thickness- 3cm.

Section- black but well-fired.

The inner side of the individual ring is slightly tapered so as to fix the other ring over it. These are found in a secondary context, but it was in use for storage purpose, mainly for paddy and rice, which is evidenced by a thick coating of mud plaster applied on the outer side of the ring to bind the rings together in providing a wall like protection. Over this mud plaster a thin coat of lime has been applied.

1.(A)- Attached to this at a distance of 10 mts., a modern R.C.C well is also noticed. Its surrounding area and this structure have been carefully planned. This well is centrally located to a square platform, made of cement and bricks having a high well-head.

2. Radhanagar (Badakaima Panchayat):

Owner- Giridhari Sahu

Location- In front of the house.

Condition- still in use; some of the upper portion of the terracotta ring well are replaced by R.C.C. rings.

There is about 70 rings are intact.

Diameter- 50cm.

Purpose- drinking water.

2.(A)- In the village about 100 mts. away from the above site, there is an interesting feature of one terracotta ring well having its terracotta well-head. It is found in the left side of the road of this village. This well was meant for common use of the villagers.



Plate - 2 : Ring well used for drawing water, Radhanagar, Jajpur

Well- Diameter- 60cm.

About 85 rings are in intact.

Height of the individual ring is 10cm.

Well-head- Made of terracotta.

- Well fired but black in colour.
- Thickness of the ring is 3cm.
- The outer body is fully decorated with incised decoration.
- Height of the well-head is 80cm.

3. Mirjapur Village :

Owner-Ananta Swain.

Location- in front of the house.

Well- Diameter-50cm.

- height of the ring is 5cm.
- depth of the ring well is 15mtr.
- The main purpose is to draw water for drinking.

Well-head is made of bricks and cement plaster.

3.(A)- One storage pot made of terracotta rings found inside the house of the same owner. The diameter of the ring at the rim portion is 25cm.

4. Samsunder Temple complex:

Inside the temple complex to the north, a terracotta ring well is found with its well-head made of stone. Diameter of ring is 50cm. and it is used for drawing water for temple rituals.

5. In this village, one Batakrushna Pani have three storage pots out of which one such pot is documented. Diameter of the ring is 10cm and the other features are same as earlier one.

6. Rahamba village(Panchayat):

In this village, there is a well of Shri Dhaneswar Behera with its well-head.

Owner- Dhaneswar Behera.

Location- in front of the house.

Depth- 5m.60cm.

Height of the ring- 12cm.

Thickness- 5cm.

Diameter of the ring- 90cm.

Well-head is made of terracotta, which is 30cm high from the surface.



Plate-3 : Ring well at Rahamba, Jajpur

The village Rahamba is located one and half km. west of Kuakhia market. In this village, a few potters family are living in a hamlet. They have their traditional occupation in making various types of potteries and ring wells, but due course of time with the decline of demand, they

have abandoned in producing terracotta rings. However, two to three ring wells exist in this area which are dated too much early time and shown their artistic excellence.

Entry to this village, we noticed a ring well belongs to one Dhaneswar Behera. The well is located in front of his house. The depth of ring well is 6 mts., having about 50 rings. Each ring measuring 12cm. in height. While the thickness of the ring is 5cm., the diameter of the ring is 90cm. One interesting thing with the ring well is that the rings used in this well are not equal in diameter throughout its depth. The upper three rings, which form the head of the well, are larger in diameter (90 cm.) than the lower rings (80 cm.).

Rings are well fired, black in colour with husk-mark. This well is still in use as a source of drinking water.

7. Another ring well is found in the house premises of one Krishna Chandra Rana of same village. The measurement of the height of the ring is 12cm, thickness 5cm. and diameter is of 90cm. The approximate depth of the ring well is 6 meter.

8. Gangadharpur Village:

This village is located 1km. east of N.H.5 (Mulapal Chhak) towards Chandikhole from Kuakhia. In this village, ring wells being used in various purposes are noticed, such as- for drawing water, for latrine and for storage grains.

(i) Drawing water- In the village a number of terracotta ring wells along with R.C.C ring wells are noticed. The terracotta ring wells have similar features like Rahamba.

(ii) Latrine- Interestingly, the use of terracotta rings in constructing latrine is noticed in the house of one Basudev Behera. It is made of terracotta rings and a group of ten rings one above the other (1 mts. high) is seen above the surface, which acts as protecting wall for the user of the toilet.



Plate-4 : Rings used in Latrine, Gangadharpur, Jajpur

(iii) Granary- In this village, rings are also used for making storage bins. One such evidence came from Harekrushna Behera, where inside of his house 15 rings are arranged to form a shape of drum for storing grains.

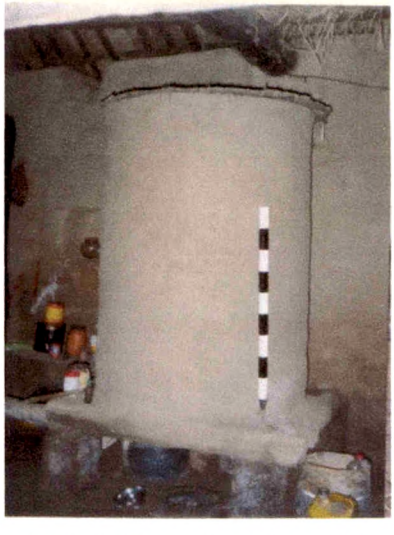


Plate-5 : Rings used in Storage bin, Gangadharpur, Jajpur

Total numbers of rings used in this structure are fifteen. Individual height of the ring is 10cm. The outer surface of the bin is plastered with mud. The storage bin rests upon a platform made of wood and bricks supported by stone at the four corner of the platform.

9. Damodarpur Village:

In the village of Damodarpur, in the same locality, a ring well is found having its well-head made by placing vertical stones. Around the rim of the ring well, above the surface,



Plate-6 : Well-head made by placing stones Damodarpur, Jajpur

stones of irregular shapes are placed in such a fashion to form a well-head.

10. Rekabi Bazar (Barhuan Panchayat):

Six km. away from Kuakhia towards Bari, the Rekabi Bazar-village is situated to 2 km. right side of Barhuan chhak. In this village, there are some terracotta ring wells which are still in use. One of the well is noticed in front of the house of Bishnu charan Pothal.

The individual height of the ring is 11cm. and thickness is of 3cm. The diameter of the ring is 60cm. It has also well-head made of terracotta rings comprising six in number, which are placed just above the surface.

10.(A) From the house premises of one Purusottam Behera, we noticed a storage bin made of terracotta rings. The storage bin is consisted of fifteen terracotta rings, each measuring 12cm in height. The diameter is 1 meter. Both the floor and roof (cover) of this bin are made of wood. It carries approximately 20-bagful of grains.



Plate-7 : Rings used in storage bin, Rebaki Bazar, Jajpur



Plate-8 : Rings used in storage bin, Rebaki Bazar, Jajpur

10.(B) Another storage bin is also reported from the house of Nrusimha charan Behera, made by 15 rings and height of each ring is 12cm. The outer surface of this bin is plastered with mud and beautiful '*jhoti* painting' are made over it. This bin is meant

for storing paddy. The floor and the cover are made of wood. It contains approximately 9-bagful of paddy.

11. Bainsira Village, (Bari block):

The village is situated 2 km. south-west of Baliapal in Bari block. So many ring wells with their beautifully designed terracotta well-heads are found in that locality.

Apart from the rings used in wells for drawing water, these are also used for covering the plants for protection agent from animal and also to check soil erosion from the roots of the plant. One such evidence is came from the house of Basudev Muduli, where rings are kept one above the other around the plants.

In case, the plant grows into a big tree, it is impossible to take the ring out. In such situation, the only way is to break the rings.

11.(A) In this village one Laxman Behera having three storage bins, which are specially discussed.

In one bin, terracotta rings are placed one above the other to a particular height and thereafter, it recedes to form a small circle at the top for acting as mouth. Here, the rings are not in equal diameter throughout the body of the bin. The lower rings are of 1 meter in diameter, while the upper one is only 50cm. It has a wooden lid for its cover. It contains 15-bagful of paddy.



Plate-9 : Rings used in storage bin with lid, Bainsira, Jajpur

This bin is consists of 15 rings and the individual height of the ring is 4cm.

12. Jalapur Village, (Basudevpur Panchayat):

This village is situated 5 km. South of Jajpur town. Two storage bins made of terracotta rings are found in the house of one Alahni Sahu. Interestingly these bins have holes at the bottom of their body and it acts as outlet for drawing grains.

After surveying the above mentioned villages, it is known that there are still continues the use of ring wells in various purposes. Here documentation is made to know the preparation and processing of terracotta rings at the village Jalapur, 5 km. south of Jajpur town, near the river Budha, a tributary of Brahmani.

PREPARATION AND PROCESSING OF TERRACOTTA RINGS:

Preparation of terracotta rings needs an elaborate process right from the selection of the soil. The soil is identified which is very sticky and free from any mixed materials or *kankar*. Potters collect this soil near by field which is close to the river and store in a heaps. They usually bring this soil from a field which is either of Government or any private owned. For the soil they have to pay the cost if it is

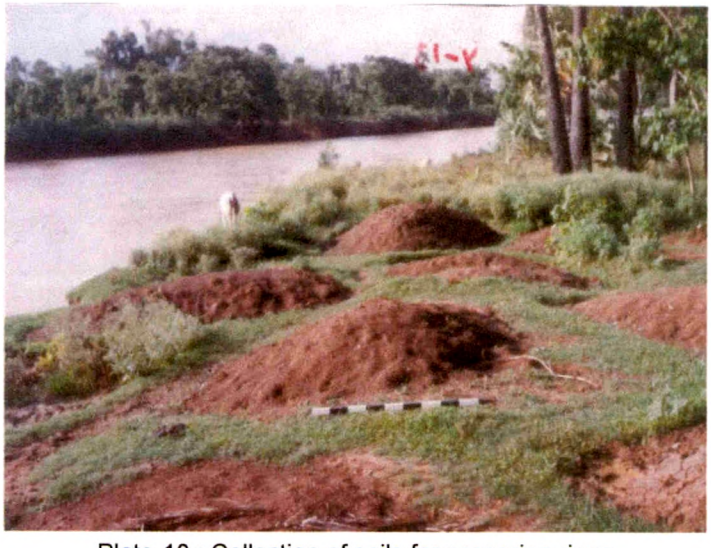


Plate-10 : Collection of soils for preparing rings, Jalapur, Jajpur

owned by private owner. In other cases, they lease the land for every year. They prefer bullock-cart and baskets to collect the soil.

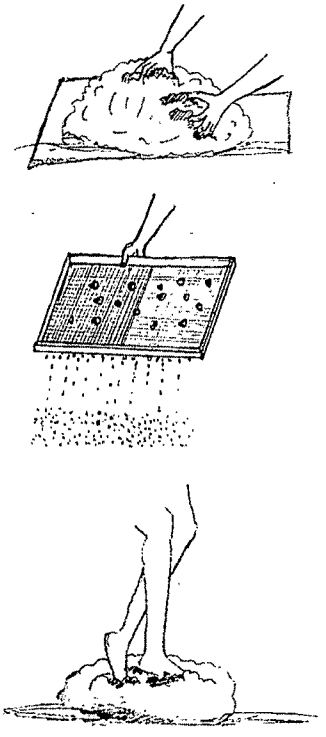


Fig. 1 : process of preparation of rings

After the collection of the soil, they seasoned the soil before the actual day of the preparation of rings. For this it takes two days, where they mix water to the soil and left for two days for absorption. On the very day of preparation, the required heap of the soil (seasoned) is taken to the working place where it rests over a polythene sheet to avoid other mixed materials like soil, grass, *murrum,* etc. Here, again this soil required due process to turn into finished clay. A mixture of soil, sand and paddy-husk in a proportional ratio is prepared by applying hands and legs. They pound this mixture carefully to produce very fine clay with sprinkling of required water.

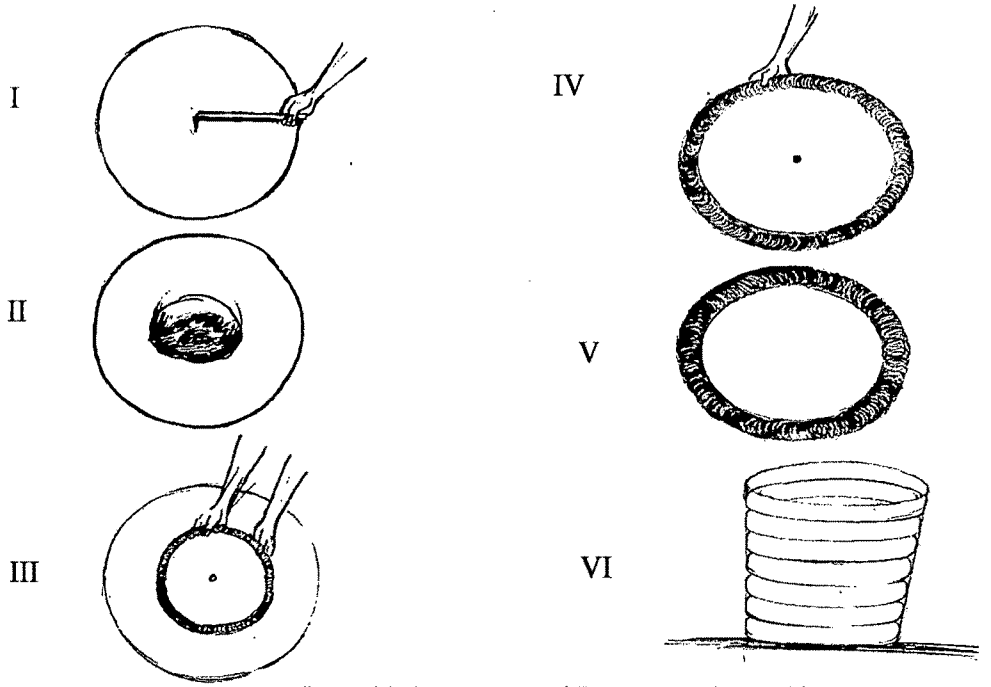


Fig. 2 : Various stages of Terracotta Ring making.

Usually the proportions of soil, sand and husk are varied from one ring to other as per the required shape and size. So for nine inches high and 3 to 3.5 ft. diameter ring, it required approximately 12kg.of clay, 3kg.of Sand and 1kg.of husk in a ratio of 12:3:1.

After the preparation of clay in order to make the ring they clean the surface of the ground very neatly where the ring is going to prepare. Than with the help of a measuring rod a circle is drawn as per the required shape of the ring. And the prepared clay is placed at the centre of this circle. With the help of hand, potter makes a hole at the centre of the clay–heap and makes a roll and slowly tried to extend this clay roll upto the periphery of the circle. At the periphery, again this rolled clay turned to a flat strip beating by hands. Then the flattened clay is vertically placed so as to form a ring. The height and thickness are almost equal around the ring and proper care has been taken not to be unequal or disproportionate.

Here, almost finishing touch is given with the help of a piece of cloth with broken pot-sherd, in order to make the ring polished. Whenever necessary, some water is sprinkled over the ring. At the end, on the neck of the inner side of the ring is slightly higher than the outer side of the ring. This is made carefully with the help of thumbs and it acts like a socket to fit the other ring over it. Finally, they give the identification marks to the rings of similar size for avoiding confusion.

Now, it became a fully prepared ring and similarly all other rings are prepared in this way. Than these rings are left in that place as it is for two days for sun-drying. After two days it shifted its place and kept one above the other according to their identification marks in a heap for eight days. After eight days again it is taken to the kiln for firing with the help of bullock-cart and other means of transportation.

Potters' kiln is a very important aspect in the pottery making and the daily life of potters. Rings are placed one above the other at the back side (chamber) of the kiln in a heap. The vacant places are filled with ash and broken potteries and finally plastered with a thin coating of clay layer except some holes to pass on the air. In this chamber, rings are kept for fifteen days where it became fully fired with the colour grayish-black. There after the rings are recovered from the kiln and taken away by the people (user) for different purposes.



Plate-11 : Potters kiln, Jalapur, Jajpur

FUEL AND ITS COLLECTION:

Fuel in the form of wood, small plant and branches of trees are an essential part of potter kiln to prepare terracotta rings. It requires a huge collection of these materials to run the kiln. In the potters' village of Jalapur, where almost all the people are engaged in this pottery-making business, specialization of work is made for their convenience.

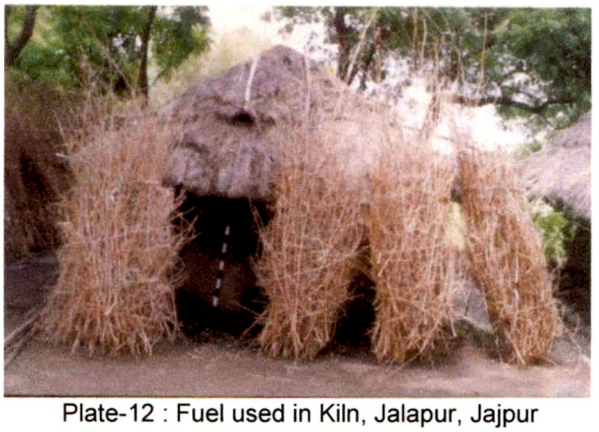


Plate-12 : Fuel used in Kiln, Jalapur, Jajpur

The female members of individual house normally go for collecting this fuel from nearby areas and forest. It takes four to five

hours to collect a bundle (heap) for carrying on their heads. The male members are engaged in making the potteries at home.

DIFFERENT USE OF RINGS:

These terracotta rings are having different uses. During our survey we noticed various types of their use and these are given below.

(A) Constructing wells for drawing water;

(B) Storing of grains;

(C) Constructing latrines; and

(D) Safeguarding plants from animals and soil erosion:

There are so many instances, where ring wells are used for procuring water for domestic purposes like- drinking, washing, irrigation and so on. Generally, the ring wells are located outside (may be in front or at the back) of a house complex in a locality. Besides house use, some temples are having these terracotta ring wells for temple rituals. The wells which are meant for drawing water is dip in their depth. The total rings are varied from 60 to 90 in number for an individual well. Well-head is also an important feature of draw-well.

WELL-HEAD: Locally to this technical term-'well-head', is called as '*ghoda-nanda*', means the covered well. On the basis of construction it is of different types such as - (i) *Ghoda-nanda* (covered well) made of terracotta; (ii) well-head made of bricks and cement; (iii) well-head made of stones.

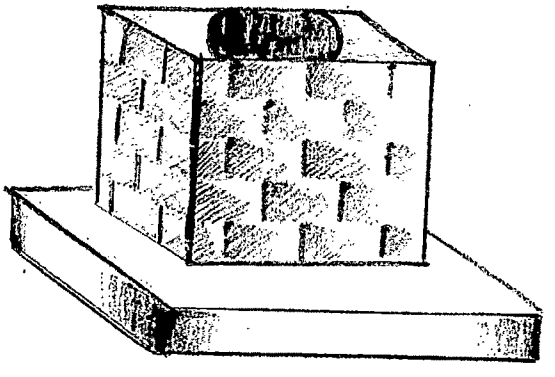


Fig.-3 : Well head

Covered well (*ghoda-nanda*), the name itself suggests a well with its cover. It is very important and popular term related to terracotta ring wells in coastal Orissa. The structural feature is basically the rings are encased one above the other up to the surface and right from the surface level a cover for this well is made of terracotta by hand. Decoration over the body of this cover is a regular feature. It is profusely carved with different appliqué designs like- vertical bands, horizontal bands, circle and so on. It varies from place to place and potters to potters. With the application of hand or finger tips, they nicely decorate this cover as per their convenient.

From outside it looks like a big pot broken at the base, as if, placed over the ring well. But normally it is hand-made and placed in such a way that its lower diameter is two to three inches larger than the rings of the well to act as a cover for the same.

(ii) Other two varieties of well-heads i.e. made of bricks and stones are the same but only difference is the material. Here in the two cases, the top portion of the well right above the surface is made of either bricks or stone. Usually it is devoid of any decorations.

The construction above the surface level of a well is called "well-head" or head of the well. The purpose or the practical utility of these well-heads are many and the important are- (a) It acts as a barrier in falling of animals, man etc. (b) It also restricts the mix up of dirty water into the well and this elevated structure gives an indication of existence of a well in the surrounding plain surface.

working level of the well and on the basis of that one can ascribe the date of this well in connection with particular layer. So working level of a well is a definite clue to date a well of a site.

(B) Storage purpose:

Rings are arranged in such a manner that it forms like a cylindrical jar for storing grains. These are also varied in shapes, i.e. cylindrical; cylindrical base with tapering top. Usual height of these storage bins varied from 150cm to 200cm. These bins are found inside the house and kept over a platform either made of wood, stone or bricks.

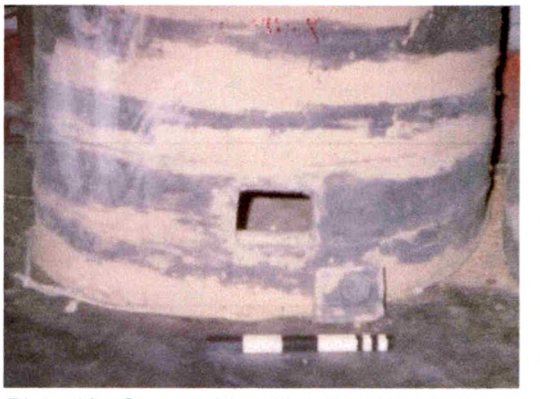


Plate-13 : Storage bin with hole at the bottom

A unique feature is noticed that almost in every storage bin there is a hole at the bottom for drawing stored-grains. The hole is also provided with a lid, which is tightened with a string. At the time of necessary the lid is opened and grains are drawn easily.

In other cases, there are no such provisions and it is without any hole at the base. The grains are taken out from the top. For this, one has to get down into this bin through a ladder and collects grains by using a basket, while another man at outside help in taking out the basket. However providing a hole to storage bin is an easy method of drawing grains.

Here another storage bin is cylindrical in shape upto a certain height and tapered gradually to reach at the top, where it is provided with a lid to cover up the bin. In some cases, storage bins are directly placed over rammed-floor, which is stronger than the surrounding surface. Invariably, these storage bins are meant for storing paddy or rice. The body of these bins and their joints are thickly plastered with clay and cow dung. Over which, sometimes beautiful white decoration (line-drawing) were made by using finger tips. All these storage bins are kept inside the house.

(C) Construction of latrine:

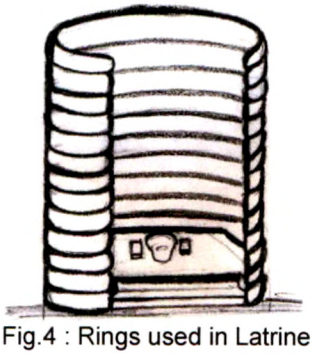


Fig.4 : Rings used in Latrine

There are certain examples, where rings are used in latrines. In the process of construction, as like draw-wells, rings are placed one above the other in a circular pit, to a certain depth (3 to 4mts.). In comparison to draw-well, the depth of latrine is much shorter. Over the top ring a pan is attached to sit on. Sometimes, the rings are placed above the surface so as to act as wall for the user, while the front portions are broken to make it as entry to the toilet. Usually these latrines are located outside of the house complex.

(D) Protection of plants from animal and soil erosion:

Interestingly terracotta rings are used to protect the plants from animals and to check the soil erosion from the roots of the plant. When the plant is small it is encircled by the rings to avoid soil erosion and when the plant grows into tree, the rings are placed to protect from the animals. But when the tree is full grown into a big tree, it is difficult to take out the rings and in that case, the rings are broken.

These are a few purposes where terracotta rings are used in rural villages of Orissa. Rings used in wells are having their economic, hygienic aspect. Economically these are cheap and its water is pure and free from any impurity due to its firing. Having a ring well indicates the economic prosperity and superiority of the owner. Terracotta rings and its use is well accepted by the rural folk. In the production of the rings specialized people are engaged and became popular due to their hand-skill. These skills run the livelihood due to the demand of the people in their locality.



Fig.5 : Rings used for fencing around the plant

PRESENT PROBLEM OF MAKING THE TERRACOTTA RINGS:

Now-a-days, those who were engaged in the making of terracotta rings as a traditional art or the family business, they are slowly detaching from it from various reasons.

(i) Govt. apathy – Neither Centre nor the State Govt. is taking interest in this art. Due encouragement is lacking from the Govt. sector to upheld this beautiful art and to provide some financial help to sustain their livelihood.

(ii) Social Restriction – In the modern age, potters are also facing some sort of social restriction due to their traditional business. Other upper class people and looking down upon them and it also creates a psychological hindrance for them.

(iii) Lack of Encouragement – There is no encouragement from any part of the society and also lack of co-operation from the general people.

(iv) Impact of Modernization – Due to modernization and advent of other new methods of procuring water, the young generation of potters' family are not involving themselves in this traditional art.

RCC (REINFORCE CEMENT CONCRETE) RINGS:

In continuation to the earlier form of terracotta rings, a new and altogether different / advance form is now in vogue, i.e. – R.C.C. rings. Presently these rings are a step forward from the terracotta rings and used by the present people for its multidimensional advantages. As like terracotta rings, it is also used for (i) constructing well for drawing water; (iii) soak-age pit (iii) for storing water (iv) toilet (Latrine) and (v) for protecting trees for animal and soil erosion.

Preparation and processing of Ring:

In order to prepare the RCC rings, the materials related are – (i) sand (ii) store clips and (iii) Cement in a proportion of 2:2: ½. For the required ratio, all materials like sand and stone clips are properly sieved to get unaltered materials and free from any contamination. This mixture is prepared over a concrete platform taking the materials dry and mixed properly with a help of hoe. Than water pour into the mixed material slowly as per requirement in order to get a semi-liquid form.



Plate-14 : Preparation of mixture for R.C.C. Ring, Balikuda Jajpur

Rings:

Over a cleaned surface the required ring is laid to prepare where there is two circular frames placed one among the other making a thin gap (4/5 cm) in between them. Each frame consists of two equal parts. These two half frames are joined by iron ware in the outer frame, where as, the inner frame bind together by using a iron bar in the middle of the frame. Usually two wooden planks placed in the inner side of the joints oil is applied in the inner part of the frame for easy extraction of the rings.



Plate-15 : Frames for R.C.C. Rings.



Plate-16 : Setting of mixture in the frame

Then the prepared mixture is poured into the thin gap between the frames (inner and outer). With the flat shovel the poured materials are properly distributed throughout their circular frame. Another pointed shovel is used for injecting the material properly in the ring. Two to three iron ware rings (dia. 3mm) are placed throughout the height of the rings. Thereafter at the top of the ring some (*Jhura*) mixture of sand and cement is applied



Plate-17 : Finishing touch given by Trowel

to absorb water from the mixture of the ring. With the help of a small trowel (*Karani*), upper part of the ring is polished, and it left for 15 minutes for setting than the outer frame in taken out carefully followed by the inner one. If needed, finally the rings are polished with the help of trowel (*Karani)*.



Plate-18 : Sprinkling of water on RCC rings.

Now these rings are left 5/6 days for drying and every day water is applied for twice, in the morning and evening to make it strong. After 5/6 days it is ready for use in any purpose.

Tools/ Instruments used for preparing the Ring:

1. Specially made iron frames
2. Shovel (One flat end and other pointed)
3. Trowel (*Karani*)
4. Brush
5. Diesel
6. Iron ware rings



Plate-19 : Instruments used for preparing the Ring.

Different Uses:

As time advanced, the terracotta rings and their uses are restricted. In the place of terracotta rings a new form of ring came up, which is called as R.C.C. rings (cement rings). Like terracotta rings, R.C.C rings are also used in various purposes, i.e., (i) for construction

of wells, (ii) for latrines, (iii) for soak-pits, (iv) used for fencing around the plants, and (v) for dust bin and others.

Now-a-days, R.C.C rings are profusely used in the construction of wells for drawing water. As the well for drawing water is very much deep, encasing terracotta rings is not an easy task and very specialized people are required. More over, terracotta rings need much care while encasing in the well. Hence, people prefer R.C.C rings for the construction of wells and other purposes.

Though R.C.C rings are used in different purposes, yet there are also some problems in it. These rings are heavier than the terracotta rings and need extra labour to handle. Its transportation is also costly.



Plate-20 : Drawing water, Ramdaspur, Jajpur

Plate-21 : Latrine, Mahakalapada, Jajpur.



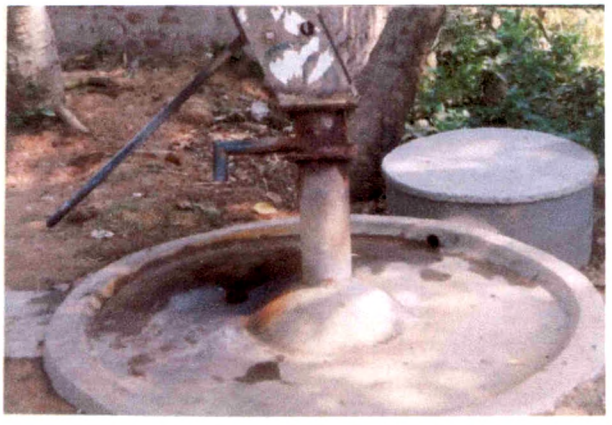


Plate-22 : Soakage pit,
Raipur, Jajpur

Plate-23 : Water tank
Ratnagiri, Jajpur



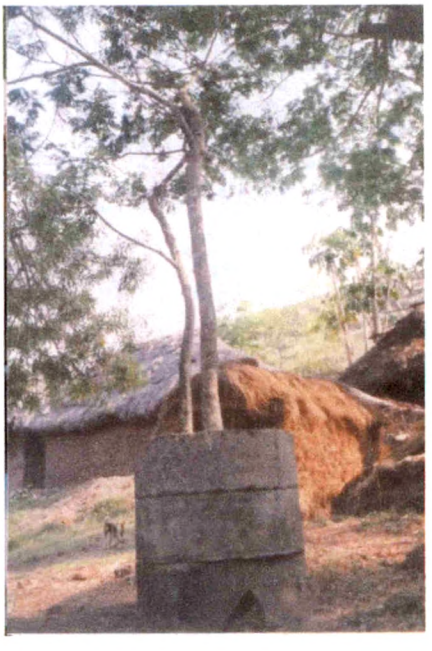


Plate-24 : Fencing abound the plant,
Kolanagiri, Jajpur

Site selection:

Before constructing a well for drawing water there is an elaborate system to have a proper place for laying the rings. In a house, people normally prefer at the outside i.e. may be in front or back of the house premises. The technicians, who are traditionally engaged in the laying of rings, can tell where the right place to dig the well is. Normally from the soil texture and land form they could know the place of digging. Sometimes, people take help from the *Vastusastra* in spotting the place where the well will be dug with relation to the orientation of house.

However, after the spotting out the place where the digging work would be conducted, there is a ritual took place on the first day of digging, where all the instruments for digging are worshiped by offering *dhupa*, *dipa* and p*uspa*. They worship *Varuna*, the water god.

Laying of Rings:

Normally the pit is larger diameter than the ring and dug up to the required depth. Usually, three persons do the work. One does the excavations, another man lift the earth to the surface and the third throws it away. While laying the rings one man brings the Nanda (rings) to another who identifies the marks of a *nanda* (ring) and lands it over to the third man working in the pit. This



Plate-25 : Digging of pits, Kampagarh, Jajpur



Plate-26 : Setting of ring , Kampagarh, Jajpur

individual lays the rings as well as fills the back side of the rings with earth. The laying of rings is started from bottom of the pit. After the ring is laid, the gap between it and the pit is filled up and then another ring is placed in this way the whole pit is aligned by the rings.



Plate-27 : Setting of ring , Kampagarh, Jajpur

It is interesting to note that, the pit lines along with the ring wells also clearly marked in the cross section of archaeological excavations, thereby indicating at least one of the old methods was similar to the one in use today. Ropes, pulleys and baskets are used for the transfer of man and materials in the pits. In this way, soak-pit and wells of different dimensions are prepared.



Plate-28 : Final setting of ring , Kampagarh, Jajpur

A COMPARTIVE CHART OF R.C.C AND TERACOTTA RINGS:

Sl No.	Subject	Terracotta ring	R.C.C ring
1	Tradition	Community involved/ traditional art (potters).	Not restricted to any community and mainly business oriented.
2	Use	Well, toilet, **storage-grains**, soakage pit, fencing plant,	Well, toilet, soakage pit, **water tank, dust bin**, fencing plants.
3	Time	5^{th} century B.C to present time.	Very recent (about 50 years)
4	Material	Clay, husk, sand, and it is locally available.	Clay, sand, stone chips,
5	Making technique	It does not need any frames. Prepared only with the help of potters hand skill.	It requires an iron frame. With out the frame, it can not be constructed.
6	size	Height of rings are varied, but not more than 15 cm.	The height is about 30 cm
7	cost	The cost of individual ring is rupees twenty.	But the cost of this ring is of rupees hundred or more.
8	Transportation	It needs greater care as it is fragile in nature and it can be transported by a single man.	Three to four persons are needed for the transportation.

9	Laying of rings	Much easier.	Due to heaviness it needs three to four person and greater care for laying rings.
10	Joining	Terracotta ring does not need any mortar as binding materials. It has its own socket.	Cement is required for joining two R.C.C rings.
11	Advantage	It has its own cooling capacity. Easy to use in different purposes. It is less expensive and the materials used are locally available.	It is easily available. The rings are reusable. Water tanks are made out of this ring.

After seeing the above chart it can be noticed that, R.C.C rings are the innovation of the present day people taking technical knowledge of the past.

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CHAPTER – V
CONCLUSION

CONCLUSION:

Urbanization is a complex phenomenon. Its origin, growth, decline along with traits are the major problem areas to define and explain. Till date various studies have been conducted from different angles to shed light on different aspects of urbanization and its features, but none of them is a complete one to provide a satisfactory solution. Generally, the very term urbanization is very often associated with city, city life, architecture, technological advancement, population growth, craft specialization, centralization of power, so many and so forth. But while fixing these criteria as a major identification from rural to urban it is difficult in historical perspective to differentiate between rural and urban settlements. In India, there are so many early historic sites which are largely failed to provide all the above mentioned urban features together. Archaeological finds also corroborate these facts. Different factors like fortifications, water management system, use of burnt bricks, use of coins and other antiquities in a group are not found in each and every individual early historic site in their initial stage. Hence, fixing criteria for calling a settlement urban is a major problem.

Authors like A. Ghosh, V.K. Thakur, D. K. Chakrabarti, R.S. Sharma and Allchin have discussed elaborately various aspects of urbanization. But it is important to discuss here the time frame of early history for better understanding of the urban process in different regions. The early history of Orissa as that of India is teeming with knotty problems. Neither it is clearly defined nor its material cultures classified properly to distinguish each phase from the other. However, there are differences in the culture sequence in different parts of the country. For north India, particularly the Ganga valley, the early historic

period is from 600 B.C. to 600 AD[1], which can be divided as follows on the basis of occurrence of Northern Black Polished Ware (NBPW). This sequence, to some extent, holds good for central and eastern India also.

1. Early historic-A (Pre-Mauryan)------600 to 400BC;
2. Early historic -B (Mauryan)----------400 to 200BC;
3. Early historic -C (Sunga)----------200 to 50BC;
4. Early historic -D (Saka/Kusana)-----50BC to 300AD;
5. Early historic -E (Gupta)----------300 to 600AD.

But A.Ghosh[2] defined early historic period in different way on the basis of permanent concentration of population. Different authors gave their views differently. But certainly, early historic urbanization, in its beginning, was confined to certain specific areas of the sub-continent. Further, it is often linked with the existence of a city or cities. However, it is important to know the traits of a city distinct from the rural settlement around 5th- 6th cen. BC. The references to ancient towns, cities, and villages in the early literature are not clear and proper in distinguishing themselves. For example, Panini (5th cen. B.C.)[3] refers to town as *nagara* and village as *grama*. Whereas, the Pali literature (5th-4th cen. B.C.) refers differently, i.e. Varanasi as *Kasigrama* and Kusinara as *Kusinagara*. Hence it is difficult to distinguish in the historical context between the settlements called *nagaras* and *gramas* in the historical context. Here the suffix like *nagara* and *grama* are not used in the true

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1 M.K. Dhavalikar, *Historical Archaeology of India*, Books and Books, New Delhi, 1999, P. 162.

2 A. Ghosh, *Encyclopaedia of Indian Archaeology*, Vol-I, Munshriam Manoharilal, 1989, P.135

- He divided the early historical period into following phases (i) cir. 600 BC to 300 BC, (ii) 300 BC to 50 BC (iii) 50 BC – 300 AD (iv) classic 300-600 AD, and late historical cir. 600 – 1000 AD.

3 S.C. Vasu (ed), *Astadhyayi of Panini*, Allahabad, 1891, pp.21-35.

sense of the term. But during the 3rd cen. B.C., literary references are clear in mentioning about the city and urban settlements. Patanjali (2nd cen. B.C) states that a city or a village may be specified on the basis of population.[4] The *Arthasastra* of Kautilya[5] provides ample evidence regarding the rise and development of urban centres during pre-Mauryan and Mauryan periods.

In this connection, archaeological excavations also show the early historic cities having no market places, shops, monumental buildings and even fortifications[6]. Keeping all these views in to account it may not be proper to ascribe important early historic settlements like Vaisali[7], Rajagriha[8], Sravasti[9], Kausambi[10], Taxila[11] and many others in their initial stage as cities.

Urban centres of early historic period possess some devices of sanitation. Water management system was a major concern in these settlements. In this system, terracotta ring wells played a vital role towards the development of the settlement. As we noticed in chapter – II, that ring wells are reported from several early historic sites of India with some variations.

As far as the antiquity of the terracotta ring well is convened, the site of Hastinapura revealed the earliest example of this variety dating back to 6th / 5th Cen. B.C. Similarly the early historic site of Rairh occupies a prominent place where the largest concentration of

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4 M.C. Joshi, *Historical urbanization in Indo-Pak Subcontinent*, Delhi, 1990, P.15.

5 R.Shamasastri(ed), *Arthasastra of Kautilya*, Mysore, 1991. P. 85.

6 M.C. Joshi, *op. cit.* (1990)P. 15.

7 *AR ASI*, 1903-4, P.81 and 1913-14, P.98.

8 *IAR*,1953-54, P.9 and 1954-55, P.16.

9 A. Ghosh, *op.cit*,(1989), pp 419-20.

10 *Ibid*, p. 422.

11 Sir John Marshall, *Taxila*, Vol-I, Cambridge, 1951, pp. 87-95

terracotta ring wells can be noticed. As many as 115 terracotta ring wells are reported from this site. Regarding distribution, ring wells cover a vast area extending from Sahabazgarhi in the north to Arikamedu in the South and Brahmanabad in the west to Mahasthanagarh in the east.

However, Joshi's theory of terracotta ring well is the only cognizable trait of urbanization is not entirely true, because it is found that there are so many factors are responsible for attaining urban character of a particular settlement. As we notice in early historic period, there are certain traits like-(i) use of burnt bricks in structures, (ii) use of irons, (iii) fortifications, (iv) currency, (v) trade, (vi) increased population and so on are no less important than the use of terracotta rings in sewerage system. Though the use of terracotta rings indicates the advancement of a culture, yet it may not be only cause for identifying an urban centre. Thus Joshi's theory of 'terracotta ring well is the only cognizable trait' of urbanization does not hold good in its entirety.

The material culture and stratigraphical sequence revealed from excavations at different sites in India show a mixed up character of more than one cultural period. In most of the cases, the Mauryan and Sunga phases were not identified separately. The fortification and the extensive use of burnt bricks in structural activities are of between 2nd cen. BC and 1st cen. AD. As per the radiometric dates, the fortifications of several sites in north India are of late in conception[12] with respect of site itself. In Orissa, fortification at Sisupalgarh, Jaugarh, Asurgarh and Kharligarh are of 3rd to 1st Cen.BC. Though fortification is a major trait of urbanization, yet it is not found in all the early historic sites. Hence a town or city may also develop without having fortification.

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12 A Ghosh, *The City in Early Historical India*, Simla, 1973, p.62.

Like other parts of India, in Orissa the process of historical urbanization started around 3rd-2nd Cen. BC, though its genesis goes back to Neolithic and Chalcolithic periods[13] and regarded as further extension of the earlier period. But towns and cities, as the product of urbanization, did not appear before 1st-2nd Cen. BC, because archaeological excavations at different early historic sites in Orissa have failed to provide basic elements of urban character prior to 2nd Cen. BC.

There are altogether twenty-five excavated sites in Orissa and out of that five are Neolithic (Prehistoric), four are Chalcolithic (metal age), ten are early historic, and six are historic/medieval periods. Neolithic-Chalcolithic village settlements of Orissa largely failed to evolve into township except Jaugarh[14] and Radhanagar[15] (explored). The early historic sites in Orissa are mostly an independent growth. Though the roots of urbanization lie in the distance past of prehistoric period, yet almost all, except Jaugarh and Radhanagar are of single cultural sites. However, in early historic sites of Orissa, urban features are more or less discernible in every individual early historic site. These sites are mostly concealed with the time frame of 3rd cen. BC. to 6th cen.AD.

The study of terracotta ring wells in historical perspective has its various problems such as - (i) ascribing the date of ring well; (ii) whether it is indigenous or foreign element; and (iii) its association with urbanization. These are the main problem areas very often faced while studying the terracotta ring wells, which are discussed below.

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13 K.K. Basa, "Neolithic and Post- Neolithic Cultures of Orissa – An over view", in S. Pradhan(ed), *Orissa History culture and Archaeology*, No.-16, D.K. Print World, New Delhi, pp22-23.

14 *IAR*, 1956-57, pp. 30-31.

15 Jitu Mishra, "Radhanagar : Early historic Buddhism, urban structure and trade", in K. K. Basa and P. Mohanty (eds.) *Archaeology of Orissa*, Vol. – II, Delhi, 2000, pp506-544.

It is very difficult for identification of terracotta ring wells in terms of its associated stratigraphical context. It can be dated to a particular period, if one can trace the 'working level' of the ring well. But in most of the cases, the upper parts of the ring wells are disturbed either by lateral pressure or by subsequent human activities. Hence, determining the 'working level' or the presence of complete upper part of ring well and its association with corresponding layer is very much essential for ascribing date to the ring well.

From the study we came to know that these terracotta ring wells were built to cater the daily needs of the people of a particular settlement. Regarding the occurrence of terracotta ring wells, it can be said that India has evolved its own culture from prehistoric to present day. Right from prehistoric time human being tried to use the water as per his convenience. So also the devices for storing water and its discharge have modified from simple dug-out pits in the prehistoric times to encasing terracotta rings in the historic period, indicating a line of development from simple to complex. In this context, there is nothing to do with foreign element in the advent of terracotta rings, though it is found some time earlier (4^{th} millennium BC) in Mesopotamia.

Association of terracotta ring wells with Urbanization is one of the essential traits for shaping particular developing habitational settlements. In the constructional aspect, the method of construction as noticed from various excavated sites in India, it is found that a wide and spacious pit, larger than the required one is dug out down to the sufficient depth. There after, the rings were kept one above another to form the required shape. After the fixation of rings the lateral sides were filled with sand and soil. This method of construction is clearly reflected in archaeological sections in the site. The study of different excavated sites also reveals the various usages of the ring wells. While fixing the

purpose of a ring well certain things are to be considered for knowing its exact use. If the rings go deep down to the water table, or in other words, if a well is laid much deep into the soil, it could be assigned as a well for drawing safe drinking water. Generally soak-pits are constructed not deeper into the soil than the draw well. For storage purpose, the method of construction would be different, as in the base portion there must be a floor made by ramming. In some cases, the bottom ring should have a hole for drawing grains, corns or other storage materials. Besides these, lids found near the ring well in the archaeological excavation are an indication for a storage jar.

Earlier, the highest concentration of terracotta ring wells was at Ganga valley, but its distribution extended to almost all states of India. Even today, they are still in use for various purposes in different parts of India. Inspite of its various usages like latrines[16], draw wells[17] soak-pits[18] and storage (barn),[19] it is basically connected with sewerage system. In Orissa, out of six excavated early historic sites, only three are having ring wells (Sisupalgarh, Khalkatapatna, and Manikapatna). Keeping above points in view, with respect to Orissa it can be said that--

(i) Orissa's urbanization is quite a late phenomenon i.e. the late-Mauryan.

(ii) Urban centres of Orissa in their geo-strategic location are found either near by a fort or a port.

(iii) Ring wells in Orissa are mostly concentrated near the coastal plains because the coastal area is formed out of alluvial

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16 A. K. Narain and T.N. Roy, *Excavations at Rajghat* (1957-58, 1964-65, Part-I), Varanasi- BHU, 1976, p. 33.

17 B.B. Lal, "Excavation at Hastinapur and other Explorations in the Upper Ganga and Sutlej basins", 1950-52, *Ancient India*, No. 10, pp. 25-26.

18 H.V. Trivedi, *Excavation at Avra*, 1962, P.24.

19 A, Nath, "Further excavations at pauni", *MASI*, No.-16, P.91.

deposits of several rivers. The water level is high in this region. Due to this, the construction of ring wells like Ganga-Yamuna Doab region is easier, rather than the rocky and dry belt of western part of Orissa.

(iv) In historical perspective, Orissan early historic sites are not properly excavated and their materials are mixed up in nature. Material cultures of each particular period with respect to layers in excavated sites are not correctly correlated. Even in the site like Manikapatna, the excavation is not even reached down to the natural soil.

With relation to constructional and functional aspects of ring well, ethno-archaeological study conducted in the Jajpur district of Orissa, which provided so many clues to know the constructions of rings and other technical aspects.

In the concluding part, after study the whole data, some remarks have been drawn which are as follows:

Firstly : The use of ring wells speaks the status of urbanization. The hypothesis advocated by Joshi is not altogether correct, but ring well certainly a cause for urban growth and an indication of urbanization.

Secondly : In sanitary aspect, it is only the human consciousness and a sense of management of his surrounding by use of ring wells in a systematic way was developed right from 5^{th} / 4^{th} cen. BC, which was no doubt a developrnent.

Thirdly : Uses of ring well indicates the utilitarian and economic nature of the people. It is not merely a structure but a material having diverse use for the growth of a culture or society. On the other hand, it also shows the economic aspect in their construction. The materials used and the labours invested are locally available and affordable so that it became an essential part of each and every house.

Fourth : With the introduction of ring wells tremendous change has been occurred in the trends of human settlement. Besides river valleys, people slowly started settling away from riverside, even in high altitude.

Finally : The emergence of ring wells not only shows the sense of hygienic consciousness but also the engineering skill of the people in the past.

However, due to lack of proper explorations and excavations, the study of terracotta ring wells and its association with early historic sites of Orissa would not clear. There are several early historic sites such as – Jaugarh, Radhanagar, Asurgarh, Kharligarh, Manamunda and many others showing urban features except terracotta ring wells, because of their small scale excavations. But future extensive and scientific excavations would throw new light on early historic urbanization in Orissa.

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